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W. J. JOHNSTON, Editor and Publisher.
N. S. KEITH, Associate Editor, Scientific Department.
T. C. MARTIN, " " News Department.
E. P. THOMPSON, " " Patent Department.
CLARENCE E. STUMP, Business Manager.

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Vol. V. NEW YORK, MARCH 7, 1885. No. 10.

Handsomely bound volumes of THE ELECTRICAL WORLD *for* 1884 *are now ready, and will be sent, charges prepaid, to any address on receipt of* $5.00.

ELECTRICITY is triumphant at Newport, R. I., public sentiment having made itself felt very powerfully in favor of electric lighting, in response to the intrigues of those who wished to get rid of the lights and, for their own personal profit, to go back to gas.

THE Municipal Council of Paris has been petitioned to adopt the electric light, and to abandon the use of gas, in the public schools and colleges. On hygienic grounds, the proposition is good and ought to be carried out. Paris has an excellent chance to set a praiseworthy example in this respect.

IT is said that the men of the Life Saving Service along portions of the Atlantic coast are feeling very much the want of telephonic communication. A special appeal comes from the exposed shores of New Jersey and Long Island. Probably a portable telephonic apparatus would be the best for the purpose.

AFTER all, it appears likely that the decision of the Canadian Minister of Agriculture against the Bell patent in the Dominion will be reviewed by the courts, an order having been granted for the hearing of arguments next May on all the recent proceedings. This disposition to reopen the question is not without a beneficial effect on Bell stock.

ONE by one, street car companies in various parts of the country are adopting electric motors to replace horses. The Cleveland service is a success. A Daft plant has been furnished for a line in Baltimore, and we now hear that the Van Depoele Electric Manufacturing Company have sold an outfit for ten miles of street railway in Kansas City, Mo. The company are very sanguine about a rapid development of this part of their business.

WE remarked last week that Massachusetts lobbyists were thirsting for the blood of the American Bell Company. The Boston *Herald* goes further and says: "The charge is made that much of the attack on the Bell Telephone Company rests on a blackmail basis, and that parties have had to be bought off in the past, such purchasing only inciting them to repeated attempts of the same kind. About $3,000 is said to have been paid in this way to one individual."

A CONCURRENT resolution was offered this week in the New York Senate requesting that the postmaster of New York bulletin at the post-office the arrival of mail steamers from Europe at this port, and calling upon Congress to inquire into the contract by means of which the Western Union Company is able to exact $1 from every one who wants this special information promptly. The resolution was tabled, but it seems likely that the subject will be brought up again, as the New York Exchanges want an improvement in the service.

ANOTHER European government, the Russian is about to see what it can do in the telephone business. Up to the present time, private companies have developed telephony in the dominions of the Czar, but now the bureaucrats of St. Petersburg intend to undertake the running of exchanges. The first experiment is to be made at Kieff, and other towns will be supplied on condition that 50 persons in each will subscribe half the yearly payment in advance. The rate of subscription is not to exceed 250 roubles ($193) per annum, for 2 miles of wire, with an extra charge of $38.50 for every additional two-thirds of a mile. Over the telephones, as over the telegraphs, absolute official control is maintained, and that means a good deal in Russia.

A DECISION reported elsewhere in this issue has just been rendered in Philadelphia favorable to aerial electric light wires. A suit was brought by the Board of Trade of that city against the Brush Company to compel the company to lay their wires underground. The judge, or master, holds that the wires are not dangerous; that they are not any more an obstruction in the streets than passenger railways, but equally a convenience, and that no proof has been given that an underground system can supersede satisfactorily the present mode of running wires overhead. The decision is a check upon the energies of those who would banish from sight every one of the wires now strung along or across city thoroughfares.

TIME is often lost in putting out fires even in this city, although New York has a very efficient fire service; but we notice that whenever any delay occurs in getting at or into a building, some of the papers at once complain of the electric wires, as though they alone were to blame. A case of delay happened last week, when a family were suffocated in a building down town. A howl was raised immediately in some quarters against the wires, but the firemen themselves came forward with the assertion that the wires had nothing to do with it, and that had it been known the family were in the building they could all have been rescued. There are some fires at which the wires are rather a help than a hindrance.

CONCERNING the dispute between the Baltimore & Ohio Telegraph and the Union Pacific Railroad companies over the right of the former to enjoy the same privileges as the Western Union Company in using the lines of telegraph of railroads that have been subsidized by the country, the Secretary of the Interior has submitted to the United States Senate a statement from the Commissioner of Railroads, in answer to questions asked by the Senate. We give the gist of the communication elsewhere. Practically, the Commissioner says he cannot help the Baltimore & Ohio Company, and that the controversy is clearly one for adjudication by the courts, as it arises out of a differing construction and interpretation of the language of the law.

WE learn from Washington that Patent Commissioner Butterworth has rendered his decision in the important telephone interference case of Bell against Gray, McDonough, Voelker and others. The case involves the question of priority of invention of the telephone. The examiner of interferences, in his decision, awarded priority to Bell in nearly all minor points, but gave priority to McDonough in the invention of the telephonic receiver. On appeal to the Board of Examiners in Chief, McDonough's device was declared inoperative, and this point was decided in Bell's favor. In his decision rendered on the 3d inst., upon appeal from the decision, the Commissioner affirms the findings of the Board of Examiners, and awards priority of invention to Alexander Graham Bell in all claims of importance.

THE influence of dull times and depression in trade can very easily be traced in the figures of the output of Bell telephones during the last three years, ending with February. Three times as many new instruments were wanted in 1882–3 as in 1884–5, and the number last year was 35,000 below that of 1883–4. These are significant statistics, and the broad, safe inference is that men doing a moderate business have economized wherever possible, and tried to dispense with the telephone. We have heard, however, of many instances in which this supposed economy has lately been abandoned, it being found that for the prompt transaction of affairs the telephone is indispensable. The business man who wants to "call up" another and finds that the other has no telephone, is very apt to form a low estimate of him, and to take orders or commissions to some one who is a subscriber.

AS an amusement roller skating is, to use the phrase of William Black, "the popularest favorite of the day." It is being indulged in by old and young all over the country. Every large city has rinks by the dozen—New York about a score—and every town and village has now added a rink to its prominent features. The rink eclipses the saloon in the eyes of the young men, and to the maidens vies in attractiveness with the church or the ballroom. Divines are wringing their hands over their rinking members, and theatre managers are positively desperate at a state of things that empties their benches, but the rink proprietors smile blandly and reap a golden harvest. The craze has done electric lighting a good turn. The exercise of roller skating is violent, and when carried on in a crowded building that is lit by gas or oil its consequences are most disagreeable. Many rink proprietors have put in the electric light lately, in order to secure greater coolness of the air and enhance the brilliancy of the spectacle. It is an ill craze that does not stimulate some industry. No better means of illumination could be devised for a large rink than the arc light, and even incandescents can be used with great effect and convenience.

MR. OCTAVIUS E. COOPE is a gentleman who has done some very successful electric lighting at his residence, Berechurch Hall, England, and for the third time in three years he writes to the papers narrating his encouraging experience. He sums it up in this way: "Briefly, the result of last year's working has been to confirm the statement and conclusions I gave in my previous letters. The lights have given even more satisfaction if possible. The whole of the machinery and conductors are working as well as when they were first put down. The expense is about the same as the previous year, being rather under that I should have had to pay for gas; and the light is so charming, convenient and healthy that after being accustomed to it one is indisposed to sit in a room lighted in any other manner." He inquires, very naturally, why there is not more electric lighting in England in country houses, if he can do so well with so little trouble; and he criticises very severely the obstructive legislation that hinders the increase of electric lighting in large centres of population. He speaks his mind the more freely because he is not in any way connected with electrical interests. We would like to see a greater number of gentlemen here, with residences in the country, follow Mr. Coope's example; and there is not anything like the quantity of electric lighting in private dwellings in our cities that there should and could be.

A CASE of importance, relating to the private use of patented inventions, has been decided in the Queen's Bench division of the High Court by Mr. Justice Kay. The plaintiffs, the United Telephone Company, are the owners of certain patents under which they have the sole right of manufacturing, in England, Bell telephones and Blake transmitters, the latter instrument being described as a combination of a diaphragm or tympanum with an electric tension regulator or regulators. The defendant, Mr. Sharples, carries on business at Preston as a chemist and electrician or telegraph engineer, and the object of this action was to restrain him from manufacturing, selling, or using any telephones or transmitters in violation of the plaintiff's patent. Leaving out details, the facts are that the defendant obtained instruments from Holland and used them for the purpose of instruction and experiment, allowing the pupils of the firm to pull them to pieces. As he could not afford to pay for royalty instruments, these cheaper ones were bought outright. The main contention for the defense was that such a use did not constitute infringement. The judge held that there was an infringement, although direct pecuniary profit was not obtained, and cited the parallel case of the importation of a pirated "Singer" sewing machine, intended only for the amusement of a member of the importer's household. To use a pirated telephone for the instruction of pupils was clearly a user "for advantage" and an infringement of the patent. The law is, broadly, the same in this country, but few ideas are more common than that a patented invention may be privately used without payment of royalty, if it is used for purposes of experiment, research or instruction.

Important Electric Lighting Developments.

A new charter is being taken out under the laws of the State of New York, for the incorporation of the American Electric Manufacturing Company, with a capitalization of $3,000,000, divided into 30,000 shares of $100 each. The object of this step is the absorption of the business of the American Electric and Illuminating Company and that of the Boulton Carbon Company, together with other important electrical interests. It is felt, and with reason, that the time is favorable for the movement, electric lighting and its allied industries having passed out of the crude and experimental stage into that of commercial and profitable development; and the consolidation has practically been anticipated in part by the recent negotiations concluded successfully between the American and the Boulton companies.

In response to the wish of THE ELECTRICAL WORLD for an expression of his views on the subject, Mr. Edward H. Goff, president of the American Company, said this week:

"Well, you know something of the struggles which we have gone through to establish our business in New England, and of the success we have attained during the last three years. This has led me to believe that what we have thus far accomplished can be repeated and increased throughout the United States, provided the combinations can be brought about that will enable us to put electric lighting on a solid, substantial basis, such as I have always been ambitious to accomplish."

"You have, then, a firm confidence in the future of electric lighting, and in an increase in the demand for electricity for general purposes?"

"Yes. When we commenced business everything in the electrical line was sold at from two to four hundred per cent. profit. Carbons and other materials were sold at many times their cost of manufacture. Therefore everything then attempted upon a commercial basis was practically a failure. I have always believed that if electrical machinery, carbon points, wire, and other large or small supplies used in connection with the construction of central lighting stations or the building of isolated plants could be put down to a basis equivalent to that of the manufacture and sale of engines, boilers, or any other commodity, the business of making the apparatus and of furnishing light could be made as successful as any other manufacturing interest in the country, and superior in that respect to many others. While I have been opposed a great deal in this belief, especially by those who have a greater interest in the manufacture of dynamo machines and other supplies, and who would rather derive an immediate profit from that than from the future matured success of the business, I think enough has been done to warrant the establishment of a company combining all these departments under one head, with its main office in New York City. That is about the sum and substance of the objects of the new organization."

When pressed for details, Mr. Goff courteously declined to enter further into the matter at present, but stated enough, in general terms, to show that the plans are in definite shape, giving the new company a wide range of operations and a powerful support. It would even appear that the possibility of a union of two or three good lighting systems is great, but on this point Mr. Goff is at present very reticent. In conclusion, he said he hoped to get the new organization in full running order so as to commence operations with it in New York about the first of May next, at the latest. As to the position and condition of the American Company, he referred to the exhaustive and encouraging report just issued by the Executive Committee of the company presented to the Board of Directors on Feb. 17, and summarized in THE ELECTRICAL WORLD last week.

A Cement for Connections in Incandescent Lamps.

One of our correspondents, who has had experience with incandescent lamps, sends us the subjoined description of the manner in which he deals with a trouble of every-day occurrence:

Electricians experimenting upon and making incandescent electric lamps have no doubt found that, in making lamps for currents of high E. M. F., they lose a great many lamps on turning on the current suddenly to the said lamps. I have experienced the same trouble, and have at last found a very easy and simple method by which I prevent any chance whatever of losing a lamp from that cause.

The reason why the lamps burst is on account of a poor connection between the platinum wire and the carbon; but I found by using the following method I succeeded in making a lamp that would stand three times the E. M. F. it was made for:

For cementing the carbon to the platinum wire I use 100 grains carburet of iron stove polish (Dixon's) ground dry to a very fine powder. To this I add 10 grains of lump sugar; place the mixture in a mortar and when stirred around and well mixed add to it 40 grains of gold bronze. Then I mix this fresh compound thoroughly, while dry, and then add water sufficient to make it into a thick, pasty mass. I apply this to the joint and allow it to stand 20 minutes or half an hour, then burn to a cherry-red heat by using a very fine gas jet. It will be found that it has then, when cooled off, the same appearance as any ordinary carbon cement. But during the process of pumping, the cement will be found to turn, and when the pumping is complete it will have a deep carmine color. This you will find is a perfect and tight joint between the carbon and platinum, and will safely answer for any E. M. F. for which you make the lamp.

Diehl's Arc Lamp.

In our last week's issue we illustrated and described an ingenious incandescent lamp invented by Mr. Philip

FIG. 1.

Diehl. In this lamp, it will be remembered, the carbon filament had no outside connection with any source of electricity, but was made to glow by the currents induced in a fine wire coil placed within the lamp. The ingenuity displayed in the construction of this lamp is also manifested in the arc lamp which has been invented by Mr. Diehl, and which is shown in the accompanying illustrations.

As exhibited in Fig. 1, the lamp presents a handsome

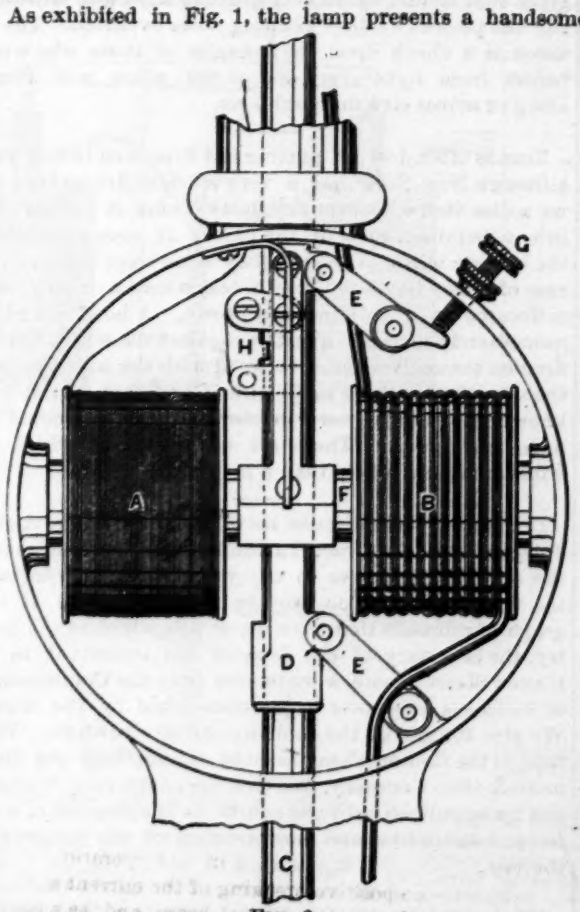


FIG. 2.

appearance, which would seem to go far toward refuting the attacks made by æsthetes upon the unsightliness of arc lamps.

The mechanism of the lamp, which is quite simple, is inclosed within the small cylindrical case shown. The case is closed by two hinged covers.

Fig. 2 shows the working parts of the lamp. As in a number of other forms of arc lamps, the differential action of two solenoids is employed to regulate the length of the arc, the coil *B* being in the main circuit and *A* forming a shunt around the arc.

The carbon holder *C* is a brass tube and slides loosely within the collar *C D*. This collar has a strip extending to the top of the case, and, as shown, is carried by the inclined links *E E*. The cores of the solenoids *F* are suspended loosely from the top of the strip just mentioned, and they radiate from a rectangular base which is bored somewhat larger than the carbon holder, passing through it, thus giving the cores a considerable range of motion horizontally. In addition to this there are three small links, attached as shown, the centre one *H* having a projecting tooth. Finally, the spring, attached to the top of the case and engaging a screw-head in the centre of the cores *F*, serves the purpose of preventing any too violent motion of the cores, acting in the same manner as the dash-pots in some other forms of arc lamps. We may add, however, that this spring has now been discarded as unnecessary.

The operation of the lamp is as follows: Before the current is turned on, the reversed arm of the upper link *E*, bearing against the set-screw *G*, holds the collar and strip *D* and the cores *F* midway between the two solenoids. In this position the toothed link *H* does not touch the carbon holder *C*, and the latter from its own weight, sliding freely through the collar *D*, brings the two carbons together. As soon as the current passes, however, the core *F* being freely suspended is drawn into the solenoid *B*; the first effect of this is to bring the tooth on the link *H* in contact with the carbon holder. As the sucking action of the solenoid *B* continues, and as the cores *F* can no longer swing freely, the tooth is pressed more and more against the rod until finally all the parts suspended by the links *E E*, following the motion of the cores, are shifted horizontally. But since the links are inclined, it is evident that any lateral motion must also be accompanied by an upward movement, which, as it occurs, raises the carbon holder and thus separates the carbons, allowing the arc to form. As the carbons burn away and the space between them increases, the selenoid *A* predominates, and drawing the cores in the other direction, allows the carbons to come together. It is needless to say that these operations follow one another without any break or interruption, and the resulting light is very steady.

In the first lamps designed upon this principle, Mr. Diehl used no carbon holder whatever, the carbon itself being clutched and raised as required in the same manner as the holder. In the later form, however, he substituted a carbon holder consisting of a brass tube, the diameter of which is large enough to permit of the insertion of the carbon into the interior. The carbon is clamped at the end of the tube, enough being allowed to protrude to last for a night's run. Upon the next round, the lamp attendant allows another length of the carbon to protrude, and so on, until the carbon is used up. By this means a longer carbon may be employed, and the waste resulting from the use of short carbons is avoided.

Four of these lamps were exhibited at the Philadelphia Electrical Exhibition, where they were run by a dynamo of the same inventor.

Cost and Retail Price of Gas.

The evidence given before the Gas Investigating Committee in this city is heard and read with interest by New Yorkers. Some of the figures and statements are of importance to electric light men, like the remarks of Gen. Roome, quoted by us last week, as to the dangerous leakage of the gas from the street mains. On Tuesday last, Mr. Graham, president of the Equitable Company, estimated that the total consumption of gas in New York City was not less than 500,000,000 feet a year, or about 14,000,000 feet a day, and that the total cost of manufacture, including materials, was only 42½ cents per 1,000. To this he added 60 cents per 1,000 for the total cost of distribution, including salaries, rent and the like. Gas companies, he said, ought to make a profit of 50 cents per 1,000. The present price is $1.75 per 1,000. Some of the witnesses gave figures as to the cost of gas and the increase in their bills. Mr. W. D. Garrison, manager of the Grand Union Hotel, showed that up to the time of the consolidation of the gas companies the consumption was uniform for corresponding months for several years. In the months of December, 1883, and January, 1884, when gas cost $2.25 per 1,000 feet, he burned 929,950 feet, costing him $2,092.39. For the same months in the following year, after the consolidation, his metres recorded 982,629 feet, which, at $1.75, cost $1,473.94. He saved $618.45, but consumed 52,779 feet more than during the same months a year ago. The reduction in price should have saved him more than $800 if his consumption was the same for the corresponding months. The same rules in regard to burning gas in the hotel were in force a year ago and now. Mr. J. Rhinelander D llon, from Dec. 26, 1883, to Jan. 23, 1884, burned 7,200 feet of gas at $2.25, costing $16.20. For the corresponding month after the consolidation he was charged for 11,200 feet, which at the reduced price cost $19.60. From Nov. 14 to Dec. 18, the first month under consolidation, he was charged with 10,600 feet, costing $18.55, while during the corresponding month in 1882, when the witness used his front basement at night and had a good deal of company—neither of which has happened since the consolidation—he was charged with only 7,900 feet, costing him, at $2.25, $17.58. Cases of this kind, and others even more striking, are not doing the electric light any harm.

A Chronological Record of Expiring Electric Motor Patents.—IV.

BY F. B. BROCK, WASHINGTON, D. C.

The patent of Yeiser, granted in 1858, employed at that date a novel mechanical arrangement for obtaining the full measure of the attractive power of an electro-magnet upon its armature.

The operation of this device will be readily apparent from an inspection of Fig. 21. A series of balance beams

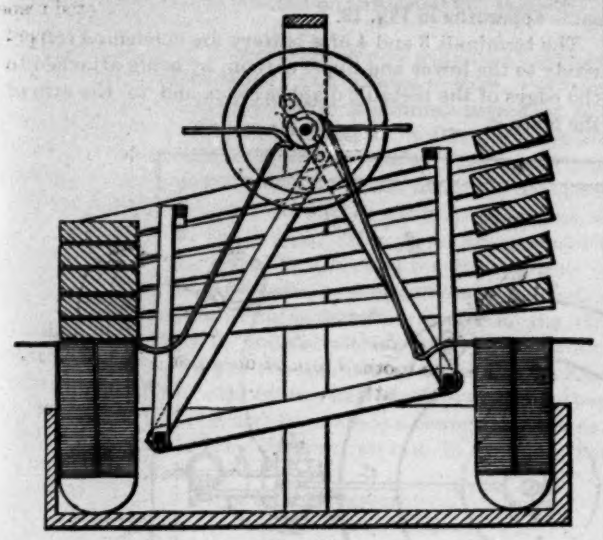


FIG. 21.

arranged one above the other is employed. To both ends of these beams are attached armatures of equal weight, which come into the magnetic field successively and are attracted to the magnets so that each one in turn becomes momentarily in effect an elongation and a part of the electro-magnet.

At each end of the machine is arranged a series of upright electro-magnets side by side, so that all their poles are in the same horizontal plane. The circuits of the two series of magnets are, however, independent of each other. The length of the series of armatures is sufficient to cover the poles of all the magnets at each end.

The commutator for closing the circuits alternately through the two series of magnets is mounted upon the driving shaft above the armature beams. The commutator consists of a wheel, one-half of the periphery of which is insulated in the usual way. The circuit is changed from one to the other of the series of magnets twice in every revolution of the shaft.

The distance between the horizontally arranged armature beams is such that the beams have a limited amount of movement independent of each other, the lower beam being pivoted so that it can have no more vibratory movement than that of the several beams pivoted above it.

Below the armature beams and between the magnets is a supplementary oscillating arm, having pivoted to its outer ends two upright rods, the upper ends of which are attached to the beam which carries the topmost pair of

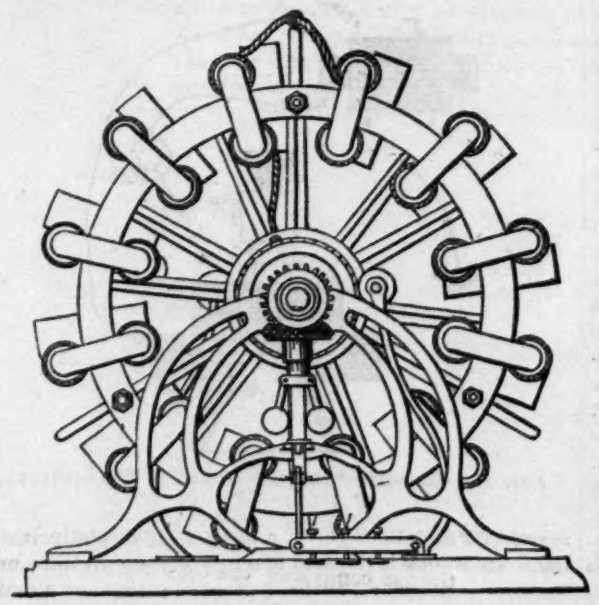


FIG. 24.

armatures. To the ends of the lower oscillating beam is also pivoted two crank arms or pitmen, the upper ends of which are coupled to the driving shaft by means of crank arms.

As all of the series of bars which are operated upon come down as close as possible together within the magnetic field of each pole, the commutator breaks the circuit of that series of magnets and closes the circuit of the other series, whereby the other ends of the series of bars are brought into action. In this way an oscillating motion of the beams is produced, and the upper beam communicates through its connections so as to produce a rotary motion of the driving shaft.

When the circuit is first closed through the series of magnets the lowest of the corresponding series of armature bars is attracted directly to the magnets, and by its movement all the other armatures opposite, whose ends rest upon each other, are caused to move a corresponding distance, upon which the lowest bar becomes magnetic, attracts the second one and draws it down in contact with it, thus giving all the beams a further movement. The second bar, as it comes in contact with the first, becomes magnetic and attracts the third, and so on through the series till all the bars are in contact, as shown in the figure.

Maurice Vergnes in 1860 again appears in the field of electricity, with an improvement upon his former electric motor, which we described on page 65 of the Feb. 14 issue of THE ELECTRICAL WORLD.

Instead of employing two distinct sets of electro-magnets revolving in double stationary helices, he now uses a single wheel, the radii of which are electro-magnets turning within a single set of helices. The distinguishing feature of the present construction is the disposition of the series of electro-magnets on a common axle and revolving within stationary helices, so that all the electro-magnets have, when passing through one end of the helices, a like polarization, and *vice versa*. Vergnes asserts that by this arrangement he obtains a continuous rotary motion without any dead point, and can generate considerable power. His device is illustrated in Fig. 22. The two rectangularly arranged helices, within which the magnet-carrying wheel revolves, are supported in a horizontal position upon a table or frame, as shown in the figure. The magnetic wheel revolves within these helices, the axle of which passes between them. The wheel itself is composed of two flat electro-magnets placed at right angles with each other, and on a common centre on the shaft. The disposition of the elements of this

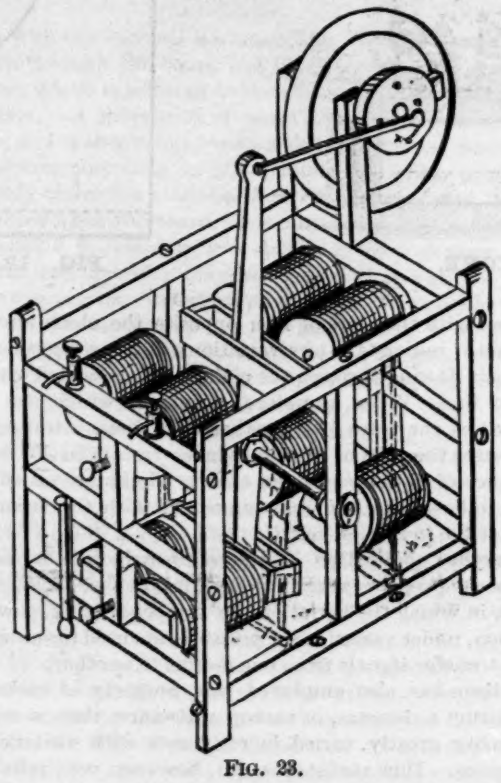


FIG. 23.

apparatus is such that when one electro-magnet approaches an inclination of forty-five degrees with the helices in its rotation, the electricity passes into the magnet. The other bar magnet is energized in the same manner.

The commutator is shown provided with anti-frictional contact electrodes.

The period during which the civil war was fought was barren of results in electric motor invention. The effect of the war is seen in the falling off of inventive activity, from the fact that between 1860 and 1867 not a single patent was issued for an electric motor.

In the electric motor patented to Lewis H. McCullough, Feb. 26, 1867, a vertically arranged vibratory armature-carrying beam is the main feature. Fig. 23 is an illustration of the McCullough motor. Two pairs of electro-magnets, one above the other, are arranged on both sides of the vertical oscillating beam, and so that the double armatures may lie in the same horizontal plane as the magnets. Each pair of armature plates is equidistant from the pivotal point of the axis of the vibrating beam. Attached to the upper end of the beam by means of a wrist-pin is a pitman through which rotary motion is communicated. An endwise adjustment of the magnets for the purpose of increasing or diminishing their attractive force is accomplished by adjusting screws at the rear of the magnets.

The lower oscillating end of the vertical beam is arranged to make and break the electrical connection between the oppositely arranged magnets.

McCullough states that in the operation of his motor there is no positive breaking of the current at any point in the vibration of the central beam, and, as a consequence, there is no loss of the electrical or exciting force upon the magnets.

On April 2, 1867, Chas. J. B. Gaume, of Iowa, devised an electro-magnetic engine of which we show a side elevation in Fig. 24, and plan view in Fig. 25.

In the Gaume construction a series of electro-magnets is placed on the periphery of a wheel, and journaled to the same axis is another wheel revolving between the adjacent magnets, carrying a series of armature plates attracted successively. The battery wires are so connected through the motor that a reserve power may be attached or detached by the motion of a governor upon the engine, the speed of which determines the battery connection.

By an inspection of the figures it will be seen that the electro-magnets are mounted upon the horizontal shaft, the wheel carrying the armatures being mounted upon the same shaft, but revolving in an opposite direction. Each of these wheels carries a bevel pinion, and both mesh with a third bevel gear, mounted upon a vertical shaft, to which

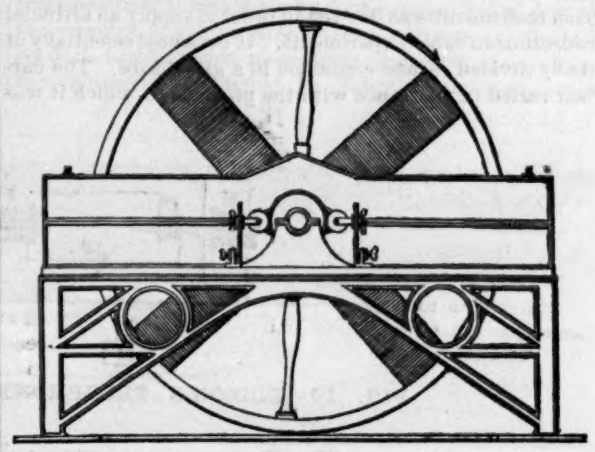


FIG. 22.

the governor is attached. The wires of the electro-magnets are led to the commutator.

The electric governor is of the usual pivoted ball construction, and revolves upon a sliding collar on a vertical shaft rotated by an arrangement of bevel wheels, as before indicated. When the balls rise under increase of speed a central rod is depressed, raising by an arrangement of levers the horizontal pivoted circuit breaker shown at the bottom of the side-elevation.

This circuit breaker or switch has three keys, which, when the switch is in a horizontal position, are in contact with three corresponding plates to which are attached wires from auxiliary batteries. When the governor reaches a certain high speed it disconnects one of the keys and consequently one of the sources of electrical power. If the speed still increases the electrical connection between the second or central key is broken, and so on. Thus it will be seen that the amount of electrical power is graduated to the speed, the successive connections being severed as the speed increases, and, conversely, being reconnected when the speed decreases.

As is usual with this type of machine, a determinate impulse in a given direction having been given to the wheels, their impetus carries them in the intervals of time when the electric circuit is broken, and the electric impulse being imparted at a certain period, the armatures are individually attracted toward the electro-magnet next in series,

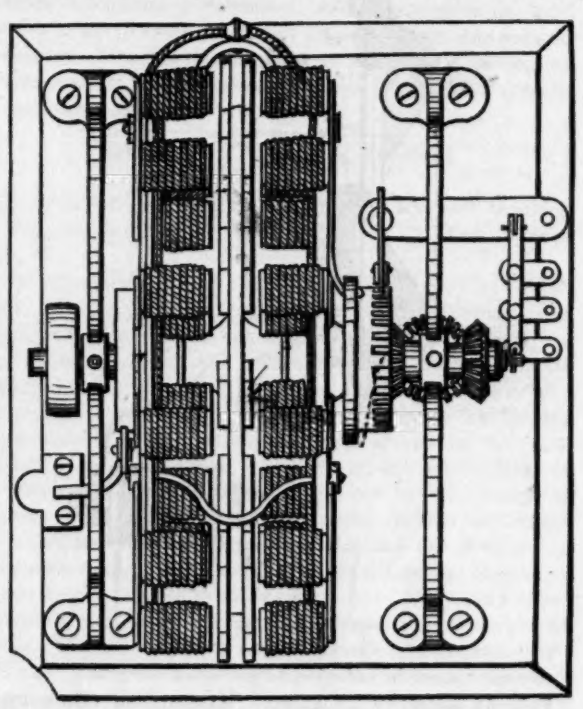


FIG. 25.

and an additional impulse is communicated, producing an increment of speed.

[TO BE CONCLUDED.]

Lightning Strokes.—Prof. Tyndall, in a recent lecture on electricity, produced the clothes of a man who was taking refuge under a tree when it was struck by lightning. It was a foolish thing, he observed, to go under a tree during an electric storm, unless a person stood some distance from the trunk. In this particular case, however, the man's clothes were very wet, and though they were very much torn, they formed a sufficiently good conductor for the lightning, and he escaped with his life. Had his raiment been dry he would inevitably have been killed. Producing the man's boots, the lecturer pointed out that the uppers were torn to pieces by the electric fluid in its anxiety to reach the earth; but the sole, into the construction of which iron largely entered in the shape of hobnails, formed a good conductor and was not hurt.

Edison's Telephonic Inventions.*

BY PROF. EDWIN J. HOUSTON.

(*Continued from page* 85.)

Edison was aware of and had practically applied the principle of the variable resistance of carbon with variation of pressure long before he used it in the construction of his carbon telephone transmitter. For example, as early as 1873, he invented his form of carbon rheostat. This instrument was devised in order to supply an artificial resistance in cable experiments. It consisted essentially of finely divided carbon contained in a glass tube. The carbon varied in resistance with the pressure to which it was subjected. The carbon rheostat does not appear to have been very successful, owing, doubtless, to the fact that its resistance varied greatly with the expansions and contractions of the inclosing glass tubes. It was also varied in resistance by sudden jars, or even noises.

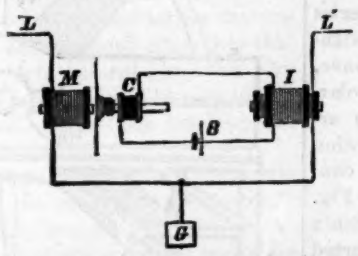


FIG. 10.—EDISON'S TELEPHONE REPEATER.

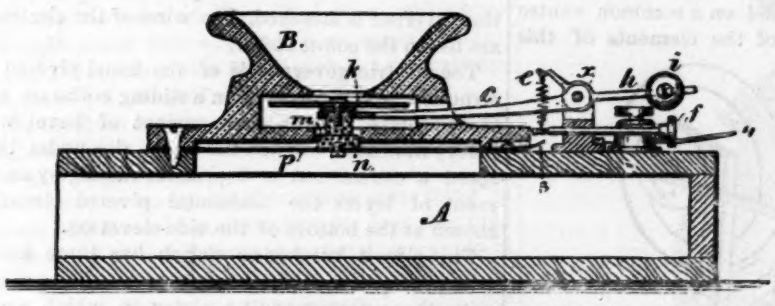


FIG. 11.—EDISON'S MICRO-TELEPHONE.

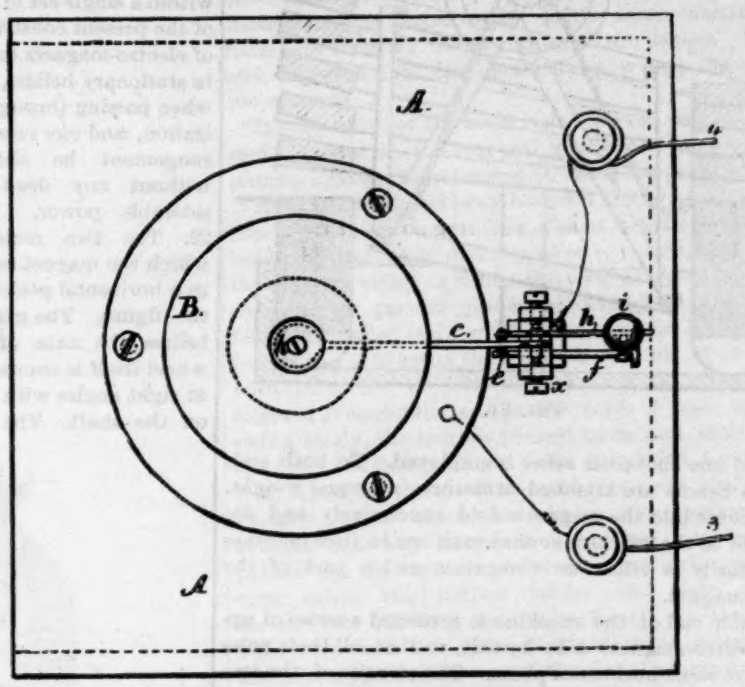


FIG. 12.—EDISON'S MICRO-TELEPHONE (PLAN).

Edison has applied the principle of the variation of carbon under pressure to a variety of other uses. Some of these applications were made prior to the invention of the telephone. His micro-tasimeter for measuring radiant heat is one of the most ingenious of these applications. A carbon resistance is included in the circuit of a battery and a galvanometer. The expansion of a metallic rod or bar, by the action of the heat, varies the resistance of the circuit and thereby affects the needle of a delicate galvanometer. This instrument is exceedingly sensitive to very slight variations in temperature, and has been employed in some refined investigations. Unless very carefully managed, however, its indications are unreliable, owing to the accidental variations in the resistance of the carbon.

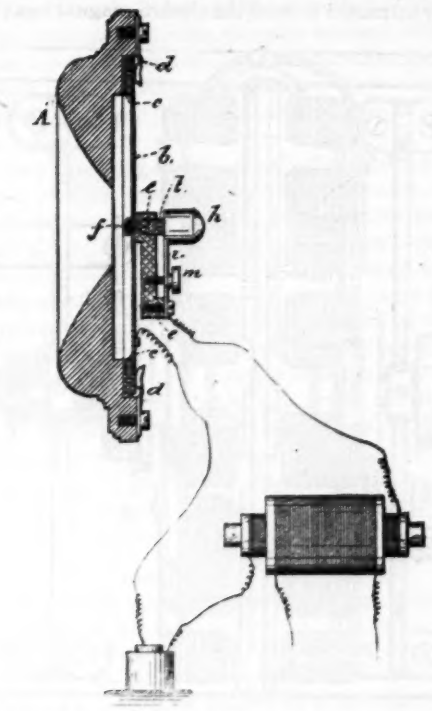


FIG. 13.—EDISON'S CARBON TRANSMITTER (MICROPHONE FORM).

What Edison terms his odorscope is a somewhat similar apparatus. It is designed, we are informed, to electrically detect the presence of various odors. A carbon resistance is, as before, included in the circuit of a battery and a galvanometer. The carbon and means for varying the resistance of the same are placed in a partially closed vessel, where they are exposed to the action of the effluvia, or odor, that is to be detected, and a motion is observed in the needle of the galvanometer. This motion, it need scarcely be added, is not, in all probability, to be attributed to any molecular action due to the effluvia or odorous particles on the carbon resistance, or on the metals or other substances that are connected therewith, but rather to pressures resulting either from variations in the temperature, or from contraction or expansion consequent on the changes in the hygrometric condition of the absorbent materials.

Another application more directly in the line of telephone inventions is a telephonic repeater. This form of apparatus is shown in connection with Fig. 10.

The local battery *B* has included in its circuit the primary wire of an induction coil *I* and a carbon resistance *C*, which acts as the transmitter. This resistance is so connected with the plate of iron opposite the electro-magnet *M* that it responds to any variations in the strength of the current flowing through the coils of *M*, connected with the main line. When, therefore, a current which has been varied by the voice of a speaker at a distant transmitter traverses the coils of *M*, it produces variations in the resistance of *C* that cause an exactly similarly varied current to flow over the line connected with the secondary coil of the induction coil *I*.

Another application of the same principle is seen in Edison's pressure relay for telegraphic use, invented in 1873, in which the variations in the conducting power of carbon, under variations of pressure, are used to automatically transfer signals from one circuit to another.

Edison has also employed this property of carbon to construct a rheostat, or carbon resistance, that is capable of being greatly varied in resistance with variations in pressure. This rheostat is not, however, very reliable as an instrument of precision, owing to the fact that the carbon does not regain its former resistance on the relief of the pressure.

In the employment of carbon as the variable resistance in telephone transmitters, Edison has obtained the variations of pressure by the action of the sound-waves in a variety of ways. Besides those we have already pointed out, he has contrived a transmitter in which the motion of the diaphragm, under the action of the sound-waves, effects an increase in the resistance of the circuit when the diaphragm moves inward, and a decrease when it moves outward under the influence of its elasticity. This he effects by supporting the carbon button between metallic cups connected with uprights secured to the middle of the diaphragm. The inward motion of the diaphragm, on the impact of the sound-waves, causes the uprights to move apart and thus lessen the pressure on the carbons. The movement of the arms in the opposite direction of course increases the pressure on the carbon button.

In addition to telephonic transmitters in which the carbon resistance is placed in one mass between two plates that are urged to and fro by the action of the voice, Edison constructed a number of devices in which two carbon buttons are moved over each other by the sound-waves and thus vary the electric resistance by reason of the greater or less intimacy of the contact, or by reason of the number of points thus brought into contact. This form of telephonic transmitter was termed by him the "micro-telephone," on account of its ability of responding to much feebler sounds than the other transmitting instruments. This form of transmitter was, in fact, a form of "microphone transmitter." The United States patent descriptive of this modification of transmitter was filed Nov. 11, 1878.

Edison's micro-telephone is shown in section in Fig. 11.

The apparatus is mounted in a hollow, resonant box *A*, and consists of a mouth-piece *B*, furnished with two diaphragms *p* and *k*.

The diaphragm *p* is placed over a circular opening in the resonant box *A*; upon this diaphragm is placed a piece of compressed carbon *n*, and a second piece of carbon *m*, secured to a lever *c*, pivoted at *x*, is placed on the carbon *n*. The arm *h* of this lever is provided with a movable weight *i*, intended to counterpoise the weight of *c* and its connected parts. The spring *e* serves to vary the pressure of the carbon buttons *m* and *n* on each other. The diaphragm *p* is securely attached at its edges to the resonant box. The diaphragm *k*, which consists of some light material, like mica, is free at its edges, and is connected by means of a screw to the end of the lever *c*, and placed below the mouth-piece *B*, in the position shown. The arrangement of the circuit is better shown in the plan of the same apparatus in Fig. 12.

The terminals 3 and 4 of a battery are connected respectively to the lower and upper carbon, by being attached to the edges of the metallic diaphragm *p*, and to the arm of the lever *c*.

Exceedingly slight jars or vibrations given to this apparatus, such as by a person walking across the room in which it is placed, or by the sound waves produced by the voice of a distant speaker, vary the current sufficiently to reproduce the voice of a speaker in a suitable receiving instrument.

A modified form of microphone transmitter invented after the preceding is shown in Fig. 13.

In this form of apparatus a mouth-piece *A*, of the usual shape, is provided with a metallic diaphragm *b*, which, instead of being rigidly fixed at its edges, rests on an india rubber ring *c*, and is kept in contact therewith by means of suitably arranged spring fingers *d*. In order to avoid a grating sound by the rubbing of the diaphragm against the metallic spring fingers, the latter are covered with rubber.

There is attached to the centre of the diaphragm, by means of a metallic screw *f*, a block *e e* of insulating material. This block is recessed opposite the screw attachment for the reception of a button *l* of hard carbon or plumbago. A weight *h*, supported on a spring-arm *i*, has one of its surfaces in contact with the carbon button as shown. This surface is platinized in order to insure a good contact.

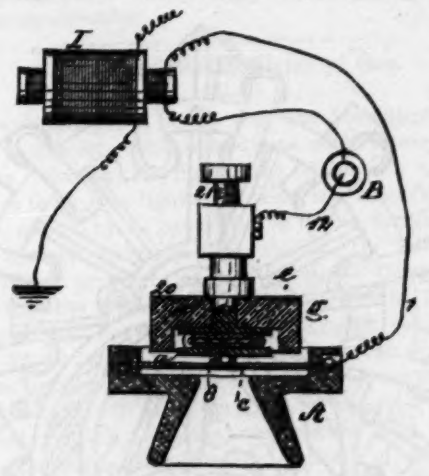


FIG. 14.—EDISON'S STRIATED SURFACE TRANSMITTER.

The circuit connections are apparent from an inspection of the drawing. The circuit of the battery cell is completed by means of the conducting wires through the carbon button *l*, and the primary of an induction coil.

The operation of this form of transmitter is evidently dependent upon the difference in the pressure against the carbon which is produced from the inertia of the weight *h*, acting as a resistance to the free movement of the diaphragm.

Edison devised a curious form of transmitting instrument, which he patented in 1882. This transmitter consists substantially of a surface or of surfaces ruled wi h fine lines that are close together, preferably several thousand to the inch. These lines, which are parallel to one another, cross the surface in two systems that intersect each other at right angles. The surface of the striated plate is thus cut

* Journal of the Franklin Institute, February, 1885.

into a great number of fine points. When surfaces so prepared are included in the circuit of a battery, and suitably combined with the diaphragm, the motions produced by the sound waves, causing a greater or less intimacy of contact, or a greater or smaller number of points in contact, produce electrical undulations in the current capable of reproducing articulate speech in a suitable receiving instrument.

A transmitter, constructed on this principle, is shown in Fig. 14.

The mouth-piece *A* is provided with a metallic diaphragm of the usual construction. The striated surface, which in this case consists of a strip of platinum, scored by fine lines as above described, is folded in a flat form with a piece of felt or rubber within the fold, and the scored surfaces placed in contact with the plates *a* and *e*. The plate *a* rests on a short section of rubber tube 6, supported at the centre of the diaphragm. The plate *e* is connected with the adjusting screw 21, provided for the purpose of regulating the pressure between the surfaces in contact.

The scored platinum foil is therefore placed in the circuit of the battery *B*, and the primary wire of the induction coil *I*, by means of the conducting wires 12 and 1, as shown. It replaces the carbon button of his earlier carbon transmitter, and operates to produce a change in the conducting form of the battery circuit in a somewhat analogous manner.

(TO BE CONTINUED.)

An Improvement in the Apparatus Used for Precipitating Copper by Electrolysis.*

BY HERBERT C. FOOTE.

Those who have occasion to make many determinations of copper by the electrolytic method have undoubtedly experienced some difficulty in always obtaining a current of proper strength, and, when the battery is to be used for two or three consecutive days, of keeping it so without changing the battery fluids.

I have devised a simple piece of apparatus which has saved me much trouble in this line, and as it has worked with extreme satisfaction in my laboratory for the past year, I beg leave to suggest its trial, at least by those who have many copper determinations to make.

The platinum dishes are arranged on a board as shown in section by Fig. 2. The current from the battery, which is kept in a room in the basement, is carried by insulated wires to the laboratory, and made to pass through a certain number of coils of fine insulated iron wire before it passes to the platinum dishes.

Fig. 1 shows the under side of the board, with the resistance coils and connecting wires sunk into it, so that no wires are visible above the board save the ones connected to the platinum strips dipping into the dishes.

The current enters at *a* and passes to *c*, where it enters a switch from which it may be made to pass directly to a switch at *g*, or it may be made first to traverse either one of the coils *m*, *n*, on its way, by a simple movement of the switch handle above the board. From *g* it may be made to pass through *h* to the switch at *r*, or by connecting the switch with *i*, *k* or *l*, the current will first traverse one, two or all of the coils *o*, *p*, *q*, and when it reaches *r* it will have the required strength. The coils have the following lengths of fine iron wire respectively: *m*, 1½ metres; *n* and *o*, 3 metres each; *p* and *q*, 4½ metres each.

More coils may be added if it is desirable, but with the arrangement shown in the cut a resistance of 1½ metres may be obtained, which may be increased, by additions of 1½ metres each, up to 15 metres, by properly manipulating the switches *c* and *g*. For example, if the switch *c* be connected with *e*, and the switch *g* with *i*, the current will pass through 4½ metres of the iron wire.

The board shown in the cut is arranged for only three dishes, but it will be readily seen that any number might be added. As the battery grows weaker, or as dishes are removed or added to the circuit, the strength of the current is kept uniform by manipulating the switches. This might be made to work automatically.

The switch *r* with its connections *s*, *t* and *u* make it possible to use one, two or all of the dishes. If only one dish is to be used, the connection is made with *s*, and the current passes through the cylindrical copper connection *v''* (see also Fig. 2, *v*) to the platinum and finally through *x''* to *b*.

If two dishes are to be used, the switch *r* is connected with *t*, and the current passes first to the dish over *v'*, thence through the platinum strip to *x'* and then to the second dish over *v''*. When all the dishes are to be used, connection must be made with *u*.

The method of automatically regulating the current in the case of removing a dish from the circuit is shown by Fig. 2. A coil of fine iron wire *w*, equal to the resistance of the solution in a dish, is placed under the board and near each dish. Through the centre of the piece of platinum 3, 4, upon which the precipitating dish rests when in connection with the current, is a small hole, which is continued down through the board and lined with a piece of copper pipe *v*, which is soldered to the platinum to make the connection. A short stick of wood 5, 6, passes through this pipe, and is so arranged with a spring 1, 2, that when the resistance coil *w* is in the circuit, the stick protrudes slightly above the platinum foil. When, however, a dish is placed upon the board, it pushes down, by its weight, the stick 5, 6, removing the strip 1, 2, from contact with *v*, thus disconnecting the resistance coil, and at the same time causing the current to pass from *v* through the solution and platinum strip to *x*. When a dish is removed, the current through 8, 9, is of course broken, and the spring 1, 2, comes in contact with *v*, making the connection with the resistance coil, which, being equal to the resistance in the dish, keeps the current the same in the other dishes.

If two dishes are to be used, and the solution is only ready for one, the switch *r* is connected with *t*, and the dish which is ready is placed on the platinum above *v''*. The current will then pass from *t* to *v'*, and through the strip 1, 2, to the resistance coil *w'*, and thence through *x'* to *v''*, and finally through the liquid to *x''* and *b*. When ready to add the second dish to the circuit, it may be done by simply placing the dish in its place over *v'*, when it will automatically disconnect the resistance coil *w'*, and the strength of the current will remain the same and sufficient for both dishes. Either one of the two dishes may now be removed at any time without altering the strength of the current, or in any way interfering with the work of the other dish in the circuit. The third dish may also be added at any time by simply changing the switch *r* from *t* to *u* and manipulating the switches *c* and *g* so as to increase the current sufficiently. In the same manner, any number of dishes may be used.

The strength of the current may be ascertained by passing it through acidulated water in an inverted tube graduated in cc. and noting the amount of mixed gases liberated in a minute; but I have found that a very little experience will enable one to tell when the current is suitable, by simply noting the rapidity with which the gas bubbles come off from the platinum strips in the liquid to be decomposed.

With the large number of determinations I have to make I find this arrangement of apparatus to be a great saving of time, and am sure it would be both neat and advantageous where only few analyses are to be made, and very desirable in the laboratory of a scientific school or college.

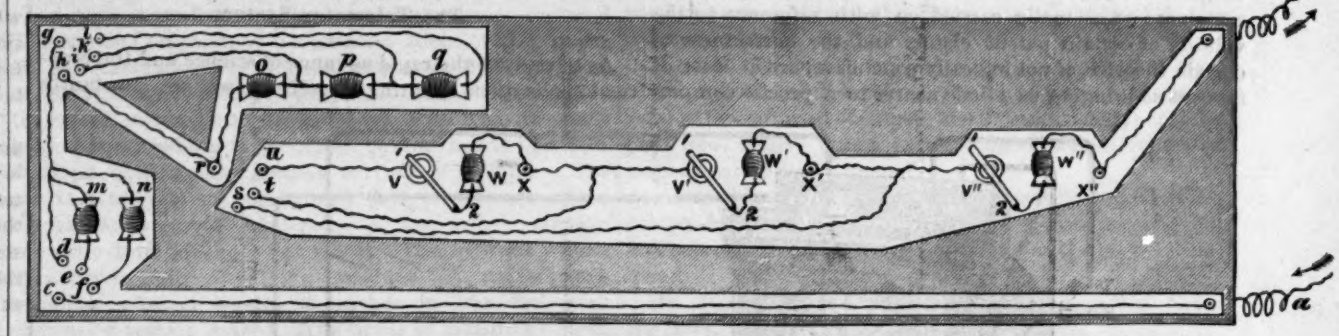


FIG. 1.—VIEW OF BOTTOM OF BOARD, SHOWING RESISTANCE COILS AND CONNECTIONS FOR THREE DISHES.

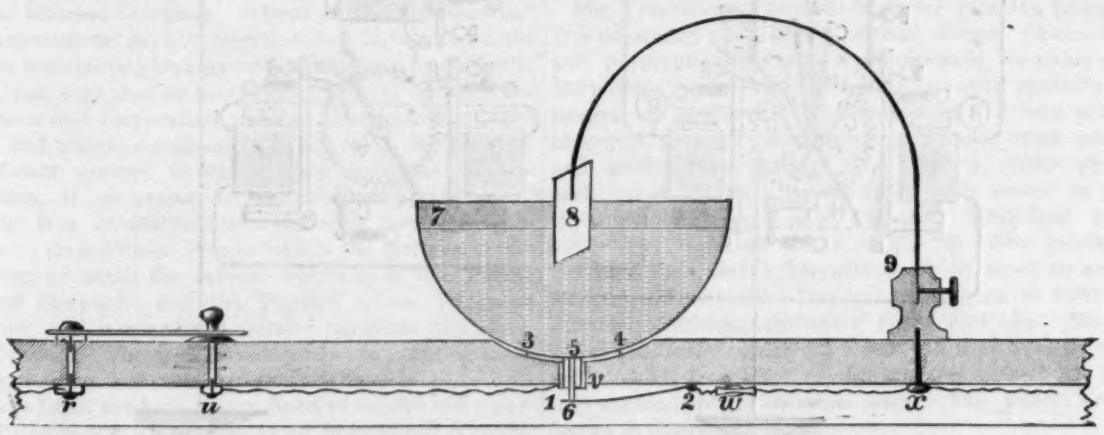


FIG. 2.—SECTION SHOWING ONE DISH IN POSITION.

Another Exhibition.—The Electrical Exhibition, organized by the Société Internationale des Electriciens, to be held at the Paris Observatory, opens on the 15th inst.

*American Chemical Journal, Vol. 6, No. 5.

The Telephone for Coast Life Service.

Writing from Mannahawkin, on the New Jersey Coast, a correspondent says: The men of the Life Saving Service are feeling very much the want of telephonic communication on Long Beach, lying between Barnegat Inlet and Little Egg Harbor, where there are many vessels wrecked every year. On many occasions during the recent heavy gales it was felt that if a telephonic system had been established here it would have saved a great deal of delay in the rescuing of vessels' crews and passengers, particularly on dark nights, when messengers sent from one station to another were liable to delay from not seeing their way by reason of the darkness and the blinding spray. During one of the recent stormy nights Patrolman Kelly, of Station No. 21, Long Beach, started up the beach on the eight o'clock watch. The night was very dark and stormy, the wind blowing the tops of the waves and causing showers of spray, which were blown across his face. He grew bewildered, passed the halfway stake without noticing it and missed the watch sent to meet him. After wandering over the sandhills in a helpless manner for some hours he at length reached Station No. 20 in an exhausted state, where he was cared for by Keeper Truax and the crew of the station. Great anxiety as to his safety prevailed at his own station when he did not return, and until they heard that he had arrived at Station No. 20 a diligent search for him was kept up. Had there been telephonic communication between these two points all anxiety would have been set at rest as soon as he arrived at Station No. 20. If a vessel were in peril a messenger sent to summon assistance, by losing his way, as this patrolman did, might be the means, by causing a delay of some hours, of precipitating a disaster which the establishment of a telephonic system would avert. It is thought that steps will soon be taken to have the much needed telephone established before the gales of next month come to swell the list of shipwrecks on this dangerous coast. General Superintendent Kimball is taking an active interest in the matter, not only for this, but for the Long Island coast.

Telephone Troubles in Vermont.

The following account of certain disputes and troubles in Vermont is given by the Burlington, Vt., *Free Press* of Feb. 27:

The superintendent of the telephone company at Greenfield, Mass., J. B. Hunt, has ordered the local managers at Burlington, Rutland and St. Albans to collect rent for the instruments now in the offices of the Central Vermont Railroad, at those places, from March 1, or to have the instruments removed. When the telephone exchanges were established the instruments were placed in the railroad and express offices, rent free, at the solicitation of the managers of the exchanges, and not by the desire of the railroad company. The managers took this action for their own benefit, rightly judging that the instruments in the railroad and express offices would make the exchange much more valuable to business men—in fact, using these instruments as a lever to get subscribers. The instrument has already been taken from the express office in this city; and now, owing to some slight personal difficulty between Superintendent Hunt and the Central Vermont Railroad, Mr. Hunt proposes to make the two hundred and thirty Burlington subscribers, who pay him between eight and ten thousand dollars a year (as well as the St. Albans and Rutland people), suffer a great inconvenience to satisfy his petty grievance against the railroad. It would seem that, under the circumstances, the subscribers have some rights in this matter that the telephone company should respect.

The telephone company has recently adopted another rule which would seem to be, in any business but a grinding monopoly, a poor business rule. If the local manager in Burlington receives an application for a telephone he cannot quote a price for the instrument nor even give an affirmative answer until the application is referred to Boston. If the mugwumps there see fit to grant the application, or to name a price that the applicant can afford to pay, he can have the instrument. If not, not. There seems to be no established price for all instruments, in similar circumstances, to pay. Under such conditions there are liable to be differences and difficulties constantly

arising that would not come up with judicious local management, and that no business but a monopoly could stand.

Telephonic Circuits.

At the present time, comparatively little attention is paid by electrical engineers or scientists to telephonic matters, says the London *Electrical Review*, although there is much that is interesting in the subject. Although we hear from time to time rumors of warfare and threats of litigation between telephone companies, or between a company and individuals, yet the rumors do not form themselves into tangible shapes. The discussions and correspondence which are occasionally carried on with reference to the validity of certain patent claims and the correctness of certain theories, if not logically conclusive, are at least of interest as bringing us a little nearer to a precise comprehension of the action of the telephone. The main point at issue is that concerning the possibility of producing articulate speech by transmitters working on the make-and-break principle. We ourselves are very far from being convinced that make-and-break working is possible, *i. e.*, that articulate speech can be *produced* by make-and-break action. That it can be produced *in spite* of such an action is quite probable. We have not yet seen one single experiment which has in the slightest degree proved that articulate speech can be *produced* by the action referred to. The fact that words were heard with a Reis transmitter is no proof whatever upon the point, as it is quite probable that the instrument is capable of causing a variation of resistance at the points of contact, though with no degree of certainty. Recently our verbose correspondent, Major W. C. Barney, has attempted to prove experimentally that an undulatory current through a closed circuit is not necessary for telephonic transmission, and he claims that the experiment of causing a rapid series of interruptions in the *transmitter* circuit, which did not prevent good articulation, was a proof of this statement. We must confess that we entirely fail to see the force of the argument. It is not clear, in the first place, why the interruptions should be chosen to take place in the transmitter rather than in the receiver circuit, seeing that it is Bell's and not Edison's claims that are being attacked; leaving this question aside, however, it seems to us that the correctness of his argument must stand or fall by a consideration of what is *technically* meant by a "closed" circuit. The technical meaning of "closed" and "open" circuit working in telegraphy is, we believe, well understood; by a closed circuit we certainly do not mean a circuit which is never under any conditions open at all, nor on the other hand does an open circuit mean one which is never closed. It would be generally admitted, we think, that a momentary interruption, once, say, every minute, on a telephonic circuit would not produce any effect on the articulation, nor would these momentary interruptions be considered, we presume, to cause the circuit no longer to be considered as a closed one. If we admit that such is the case for momentary interruptions once a minute, we ought, logically, to admit it for momentary interruptions once in, say, every hundredth of a second. The argument which seems to be advanced, that an intermittent current cannot be an undulatory one, is decidedly weak. In the case of a permanently closed circuit we have undulations passing which may be represented by a *continued* sinuous line; when the interruptions take place this line becomes a dotted one, but it is none the less a sinuous one, that is of an undulatory form. The word undulatory does not, we contend, necessarily imply continuity. With reference again to the term "closed," its obvious technical meaning is, we take it, a circuit which is closed at *some* period or periods of the time during which it is in use. It is, we believe, a generally well-known fact, that the interposition of a "condenser" in the receiving portion of a telephonic circuit does not prevent the apparatus from working; indeed, except under certain conditions, it produces no appreciable effect; that is to say, the articulation is quite as loud and clear as when the condenser is not used. Such a circuit can hardly be considered a closed one within the general meaning of the term, yet it seems that no one has brought forward this fact as an argument against the soundness of the Bell claims. The action of the telephone may or may not be explainable on the undulatory theory, but we must hold that it requires experiments of a very different character to those hitherto described to prove the actual facts of the case.

The Telemeter System.

As a result of the rapid advance of science and the practical applications resulting therefrom, we are constantly brought face to face with new terms which characterize some new phenomenon, invention, or device. Thus the word "Telemetry" has lately come to be applied to that branch of the arts which deals with the indication and recording at a distance of the physical changes of the atmosphere and the variations in the conditions of other fluids or solids. The telethermometer and telebarometer, for instance, record respectively the temperature and pressure of the atmosphere. Although the word "telemetry" is a new one, the art in its primitive state dates back more than a quarter of a century, Wheatstone being among the first to construct instruments which, although crude, might be called by the names just used above. Since then, various means have been employed with varying success in order to obtain the desired object, but the recent combined efforts of Mr. Robert Hewitt, Jr., and Mr. Charles L. Clarke would seem to have brought telemetry to a successful issue and to a practical form.

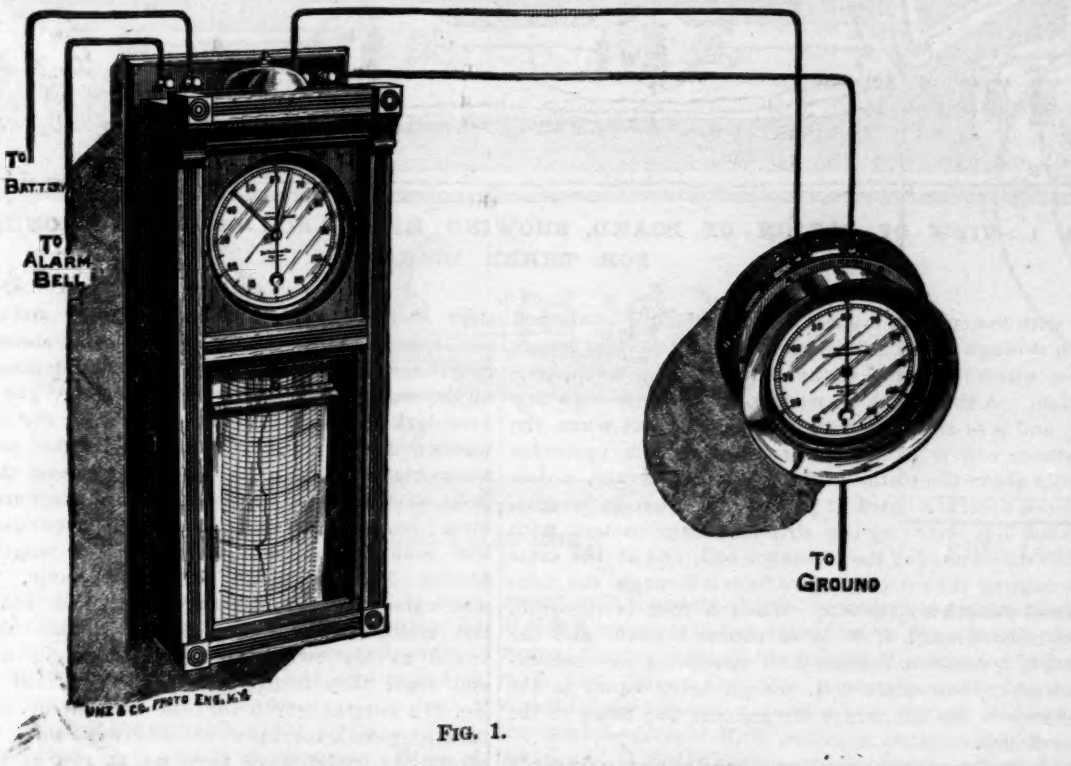


FIG. 1.

In order to explain the system devised by these two gentlemen, it must be borne in mind that every telemetric system requires one instrument which is acted upon by the changes which it is desired to record, and another which shall accurately reproduce every change exhibited by the former. The instruments employed in the present systems are shown in the accompanying illustration, Fig. 1, that to the right transmitting the impulses, and that to the left receiving and recording them.

In order to understand the working of this system, we refer to the diagram shown in Fig. 2, which represents at the left the transmitting, and at the right the receiving and recording instruments, connected up by the circuits shown. We will suppose the instrument to represent a metallic thermometer, the central spindle of which corresponds to that of the diagram, marked *A*.

This spindle carries a pointer *H* and the arm *A'*. Encircling the spindle *A* there is a hollow shaft or sleeve which carries the toothed wheel *W* and the arms *C C'*. The latter carry contact points, as shown, and are insulated from the sleeve and from each other. The central spindle *A* is electrically connected to the line by the contact *B*, while *C* and *C'* make connection through the two insulated posts *D* and *D'*, which carry wires sliding in grooves in the insulated hubs of the arms. By this arrangement an unbroken circuit is maintained between *C* and *D*, and between *C'* and *D'* respectively, no matter in what position the wheel *W* may be. In its normal condition the instrument stands as shown, with the wheel locked by the pawl *L* and the pawls *P* and *P'* clear of the teeth.

The receiver has a precisely similar arrangement of pawls, and every movement of the pawls *P* or *P'* is followed by a corresponding movement of *R* and *R'*, which results in turning the toothed wheels in one direction or the other in unison. At each movement the locking pawls slip over into the next spaces and lock the instruments so that the wheels can only move the distance of one tooth at each impulse.

For the purpose of illustration we will suppose that a change of temperature has revolved the shaft *A* and brought the arm *A'* in contact with *C*. This closes the circuit and a current passes from *D* through the resistance *R'* and electro-magnets *M*, *N* and *O*. The magnet *M* is adjusted to attract its armature, carried by the bent lever *B*, first; this throws the pawl *P'* forward, but before striking the wheel the arm encounters the contact *E*, which forms a shunt around the contacts *A'* and *C*, and cuts out the resistance *R'*. Thus, when the pawl finally reaches the wheel and moves it, the contacts *A'* and *C* are separated without a spark, as a shunt of no resistance is formed around them. The wheel having been moved, the pawl *L'* falls into the next tooth, and the arm *A'* again occupies its central position between *C* and *C'*.

The action in the receiver is nearly identical. Here the magnet *N* has thrown the pawl *R'* forward and moved the wheel the distance of one tooth.

The coil *O* is so adjusted that it attracts its armature last. When this occurs, however, the bent lever *K* is struck at *F* and thrown up, which breaks the circuit at *S*. The magnets *M*, *N* and *O* immediately loosen their hold and their respective armatures are withdrawn to their original positions. The points *C* and *C'* being already in that state, the whole system will be seen to have come to its normal state, ready for the next change.

It is evident that the system can be applied to a number of uses, and this fact has already led to its adoption for recording the temperature and pressure of the air, steam pressure, the height of water in reservoirs and for other purposes.

We may add that although our illustration shows the record as being made upon a long sheet unrolled by clockwork, the latest form of instrument marks its readings upon a circular dial which is revolved at a regular rate under the marking pencil.

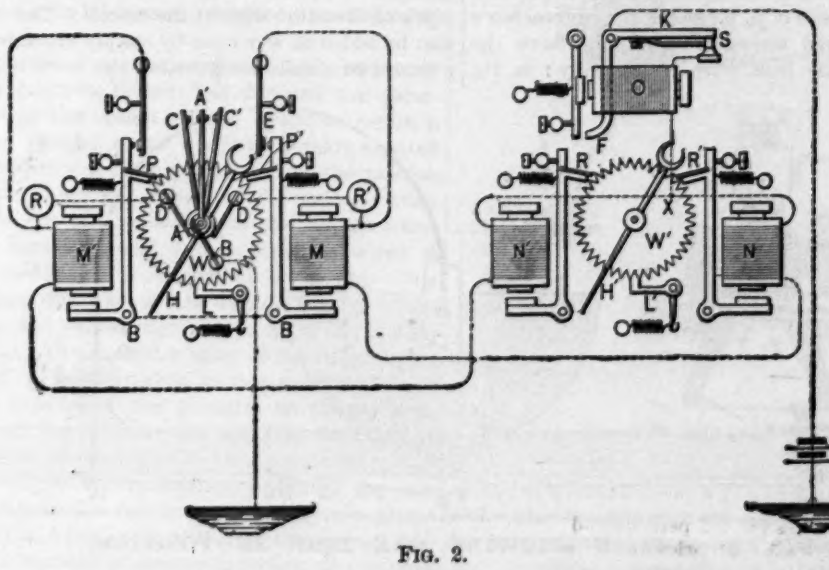


FIG. 2.

In Favor of Aerial Wires.

Mr. William Henry Rawle has filed his report as master in the suit of the commonwealth, at the instance of the Board of Trade of Philadelphia, against the Brush Electric Light Company. This suit was brought to compel the company to lay its wires underground, and the court was asked to restrain by injunction the maintenance of its posts, poles, cables and other enroachments upon the highways. The master reports that there are strung upon the company's poles 55 miles of wire, of which 15 are used by the city for public lighting and 40 for private use. The poles and wires are component parts of the apparatus used for producing the electric light, whose benefit to the general public the master dwells on at length. He finds that the wires are not a source of danger to travelers on the highway, by

reason of the electric current with which they are charged, nor do they increase the risk to property in the event of fire, although he admits that if all overhead wires were removed easier access could be had by ladders to burning buildings. He further finds that no satisfactory proof has been made that the underground system has as yet been found to be so effective as to supersede the present mode of overhead lighting. He adds: "Mutual accommodation is as necessary in the inhabitants of a town as it is in private life. Courts of equity can no more remedy by injunction the complaints of citizens against the merely objectionable incidents of city life than can divorce courts interfere to cure objectionable incidents of married life. Breadth of view, common sense and a large regard for all classes must be the guide in such cases. The occupation of our streets by passenger railways is at all times more or less an obstruction to free travel over them, and in times of heavy snow the use of the streets is absolutely governed and regulated by their occupation by the cars, and yet it would probably be considered that to enjoin their running would be a worse evil than the other." Mr. Rawle recommends that the bill in equity be dismissed without prejudice to any right which the plaintiff may have to proceed at law.

Railroad Telegraph Privileges.

The Secretary of the Interior has transmitted to the Senate a letter from the Commissioner of Railroads, in response to a resolution of the Senate asking whether the Union Pacific Railroad Company and other land-grant or bonded railroad companies have constructed and are maintaining and operating their own lines of telegraph, and whether telegraph messages are accepted and transmitted for all persons and corporations without discrimination. The Commissioner says the resolution was sent to the railroad companies, and that replies have been received from the Union Pacific Railway Company and the Central Pacific Railroad Company. "Both of these companies," the Commissioner says, "claim that they have constructed and are maintaining and operating their own lines of telegraph, and that they do accept and transmit messages for all persons and corporations without discrimination as to price and other conditions. While this is, perhaps, a sufficient answer to the specific inquiries of the resolution, it is proper to say that the underlying question is a controversy between rival telegraph companies. I do not deem it to be within the purpose of the resolution to detail the several contracts of the Pacific Railroad companies and the Western Union Telegraph Company, which operates a general telegraph line along all their roads. The railroad companies, in granting these privileges, have not alienated their control of their own telegraph lines, nor have they refused to receive and transmit all telegraphic dispatches for all persons and corporations without discrimination as to price or other conditions. This, as to any particular message, whether from individuals or from rival telegraph companies, is not controverted, but it is claimed by telegraph companies which compete with the Western Union that they are respectively entitled to insist upon the right, not for particular messages, but for an arrangement under which they shall be enabled to transact a rival and competing telegraph business under equal or equivalent facilities as those accorded under existing contracts to the Western Union."

Continuing, the Commissioner says that at a hearing in his office, at which representatives of the Baltimore & Ohio Telegraph Company and the Union Pacific Railway Company were present, the former maintained that the latter company and all land-grant railroad companies were required to transmit their messages in precisely the same manner as messages of the Western Union were transmitted. They claimed the same facilities regarding wire or mechanical connection, the keeping of accounts, the transfer of messages, etc., as are enjoyed by the Western Union. The Union Pacific representatives, on the other hand, maintained that their relation to the Baltimore & Ohio was the same as to an individual offering a message or succession of messages, and that such duty did not extend to the keeping of mutual accounts, the extension of credit, the affording of mechanical connection, or to anything beyond the receipt at the telegraph offices of the Union Pacific Company of messages on the same terms and in the same manner as if the messages were offered by an individual. In conclusion, the Commissioner says that the controversy arises out of a differing construction of the same law, and that the question is clearly one for judicial action.

Railroad Velocipedes and Hand-Cars.

We illustrate on this page the patent velocipedes and hand-cars manufactured by the Kalamazoo Railroad Velocipede Company, of Kalamazoo, Mich. Fig. 1 shows the new steel railroad velocipede, weighing only 135 pounds, to carry one or two men as may be desired. With no wind to retard, from 15 to 18 miles an hour can be made with this car, which is propelled by the hands and feet with an easy motion similar to that of rowing. The car is a tricycle so constructed that its operation and movement are not hindered by the usual friction and side draft of the brace wheel. The forward wheels are drivers and draw the machine. A patent anti-buckling all-steel wheel, 20 inches in diameter, with suspension tension is used. The tire is of machinery steel, flanged and hardened. Steel staples are riveted in countersunk holes in the tire. Bessemer steel spokes, doubled, with conical-shaped heads, made cold, pass through staples, and the heads are hooked in recesses in the hubs. The hub is composed of three pieces. Tension is produced by screwing the box through the outer spoke receptacle against the inner spoke receptacle, forcing them apart, thus drawing the tire toward a common centre, making it perfectly true and round.

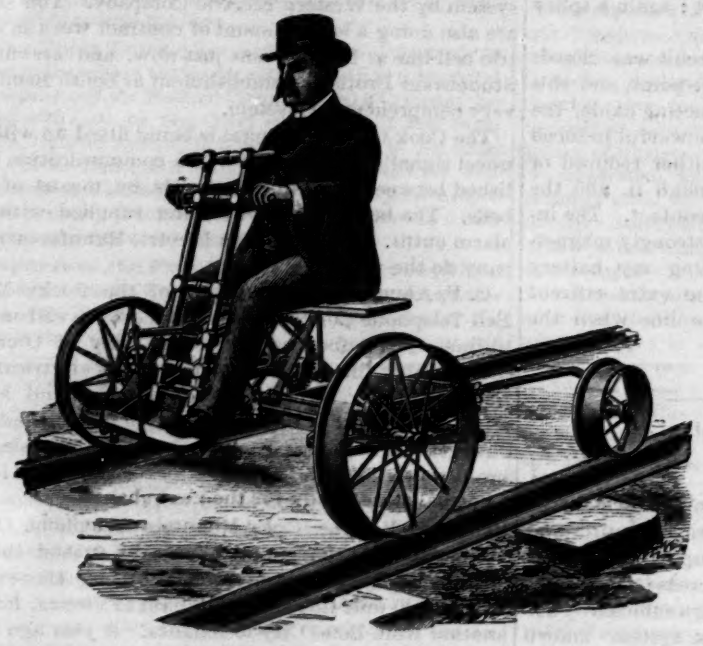


FIG. 1.

FIG. 2.

Fig. 2 represents a section hand-car recently patented. It is admirably adapted for section, bridge, construction and telegraph gangs, and a lighter kind, weighing only 350 pounds, but of the same plan, is made specially for telegraphic purposes. The cranks of the cars are set obliquely to each other, doing away with dead centres and economizing power. The trussed levers passing each other to their pivots apply their power to both sides of the spur gear, securing additional leverage. The S-shaped brake works on both wheels at the same time, and is instantaneously operated by simply stepping on the pedal. The gas-pipe frame is light but durable. Each car is provided with a tool box. The car frames are made of selected white oak supported by truss rods and 1¼-inch hard machinery-steel axles. All bearings are made of anti-friction metal. The wheels are 24 inches in diameter.

In regard to the merit of these velocipedes and cars, the company have a great many testimonials, of which several are from operators, agents and train dispatchers.

Reporting the Arrival of Mail Steamers.

At Albany, in the New York Senate, on March 3, Senator Murphy introduced the following concurrent resolution in reference to the refusal of the New York postmaster to bulletin the sighting of foreign mail steamers at Fire Island or Sandy Hook till a number of hours had elapsed after the steamer was sighted, and sometimes till the vessels were at their wharves, in order that, by a secret contract made with the Western Union Telegraph Company, the latter might charge $1 to every one who wanted information which the public should obtain as a matter of right:

Whereas the present system of suppressing the news of the arrival of foreign mail steamers by the postmaster of New York is an injustice to the people of that city; therefore, be it

Resolved, That the said official be instructed to obtain from any telegraph company the earliest news of the sighting of incoming mail steamers, and without any delay exhibit the same to the public on the foreign bulletin board in the post-office corridor.

Resolved, further, That the contract of the post-office with the Western Union Telegraph Company be examined by a Congressional committee for the purpose of ascertaining why the post-office should play into the hands of the Western Union by suppressing from the public all knowledge of the arrival of foreign mail steamers until they have passed Quarantine or, oftener still, until they are moored at their wharves, for the sake of enabling the Western Union Telegraph Company to charge the sum of $1 for announcing the arrival or the sighting of a foreign mail steamer, although the distance to Sandy Hook is but eighteen miles.

Resolved, That as all the exchanges of the city of New York are in favor of receiving the earliest news of the arrival of foreign mail steamers, the Postmaster-General be instructed to give orders to have these abuses remedied and the public fairly treated.

Resolved, finally, That as similar abuses now exist at the custom-house and barge office, they be also investigated and corrected by the proper authorities at the earliest moment.

Mr. Murphy's concurrent resolution was tabled under the rules, without discussion.

Bell Telephone Figures.

The new fiscal year of the Bell Telephone Company ends with the calendar year. The old fiscal year, or that for which the output of instruments was reckoned in past annual reports, ended with Feb. 20. The net gains and losses in instruments put out by months for three years have been as appended, the figures being in every case a gain, except in the months ended Nov. 20, 1884, and Jan. and Feb. 20, 1885:

Fiscal year.	1882-3.	1883-4.	1884-5.
March	5,192	4,739	3,252
April	6,690	7,342	4,483
May	7,469	6,758	5,023
June	6,362	7,038	4,568
July	3,787	5,846	2,278
August	4,678	3,569	616
September	4,276	4,365	1,374
October	4,136	3,706	299
November	5,033	3,811	*335
December	4,532	4,191	379
January	4,744	3,164	*298
February	5,806	2,799	*594
Total	62,705	57,328	22,272

*Net loss.

A contemporary says the company lately drew its check for $50,000 in favor of Lawyer Dickerson for legal services; that the expenses in 1884 were probably heavier than in 1883, when they were about $130,000. The legal expenses in 1885 will probably be large, but after that they should be diminished.

The Dangers of High Tension Currents.

M. Hospitalier writes the following in *l'Electricien*: "The use of currents of high tension offers, as is more or less admitted by every one, obstacles and dangers which delay their industrial application. Alluding at present to the dangers only, we think it right to remind our readers that they appear to be admitted as real even by the most pronounced advocates of the high tension currents. In October, 1883, M. Joseph Bertrand, perpetual secretary of the Academy of Sciences, wrote in the *Revue des deux Mondes* as follows: 'In a large machine everything, even the danger which we must face, is large. The dangers are foreseen, we must know how to neutralize them. Let the E. M. F. be 7,500 volts, it will be certain death to whoever touches the conductors; every one must be warned. Is it safer to live among mechanical wheelwork?' * * * It is quite natural that we have sought to eliminate those dangers, and, while we are awaiting the publication of the proceedings of

M. Marcel Deprez, Dr. d'Arsonval has, in a note read before the Academie des Sciences, at its meeting of the 26th of January, 1885, indicated from his point of view in what manner the problem may be solved. M. d'Arsonval states that, in general, the accidents which have occurred up to the present time did not take place while the electric current had a permanent existence, but at the moment of the breaking or of the making of the circuit. That is a statement which does not appear to be borne out by facts. As a case in point, we cite the fatal accident which occurred recently in England at the Health Exhibition with a high tension Hochhausen machine *without interrupting the circuit.* It is, then, a perfectly established fact that a great difference of *permanent* potential, that is to say, such as not to be perceptibly lowered by the discharge through the human body, is capable of causing death. This does not in any way affect the exactness of the propositions laid down by M. d'Arsonval in the note referred to above, but we wish to show clearly that those propositions do not apply to the current whilst actually flowing, but to the moment of its interruption. The self-induction of a circuit setting up, at the moment of the interruption of the current, an E. M. F. of self-induction of short duration and of far higher tension than the initial E. M. F. which maintained the current, any arrangement capable of absorbing or diminishing that E. M. F. will undoubtedly lessen the danger, and we are glad to admit that the shunt-voltameters may be capable of neutralizing the effect of the extra current. But this result, whose usefulness and importance we are pleased to recognize, does not in the least diminish the danger of the contact by the human body between two points of a circuit whose difference of potential is great. It will therefore be useful to seek to determine experimentally the limits beyond which the tension would become dangerous in practice; the subject is not, however, adapted for direct experiment, and if we can succeed in determining those limits, it will be judicious to apply the means recommended by M. d'Arsonval for preventing the extra current, set up by the interruption of the circuit, from exceeding them."

Fournier's Compass Regulator.

This instrument was described recently in Paris, as a kind of slide-rule, by means of which all the necessary corrections may be applied to the compass to enable it to point accurately, so that the ship may steer in the required direction. The magnetic needle of the compass pivoting always in such a way as to point northward enables the sailor to find the angle which the axis of the ship should form with the magnetic meridian. The solution of the problem involved by this would be simplicity itself, if the magnetic needle were always to point accurately toward the pole; but owing to the influence of the magnetism of the earth, the angle formed by the magnetic meridian with the true meridian varies according to the position of the place, or, in other words, it changes with the displacement of the ship. Moreover, the magnetic needle is affected in its course by the various descriptions of iron and steel which are now used so extensively in the building of ships.

The angle formed by the magnetic needle with the true meridian is generally determined by means of astronomic observations. Sometimes, however, it becomes necessary to change the direction in the interval between several observations; in that event, the corrections at hand are only those that apply to one road only, and in order to find those for all the points, a considerable amount of valuable time must be sacrificed, and great changes must be made in the road taken by the ship. Owing to this difficulty, the known methods of correction have been abandoned by the mariners, who have raised serious objections to all the different methods proposed to them, more especially since the speed of ships increased. On that well-beaten track, the road from the ports of Northwestern Europe to New York, the speed of the ships is often near 20 geographical miles per hour, and if the deviation be but two degrees in the road, the error reaches up to 15 miles in the end, which is sufficient to bring the ship to grief altogether.

Captain Fournier's instrument, which is based on "geometrical deductions," is made without any magnet; and by means of a very simple mechanism it enables the operator to perceive at a glance what corrections require to be made for all the directions of the ship. In point of fact, all the corrections are stored up, as it were, in this instrument, without any change in the road, and consequently without any loss of time. The instrument that was laid before the Société d'Eléctricité was made on board the Volta in the Chinese waters, by a skillful ship's stoker, and it is to be exhibited at the Electric Exhibition to be held at the Paris Observatory.

Small Storage Batteries.

To the Editor of The Electrical World:

SIR: Will you kindly inform me how I can make a small storage battery that will support one 8 candle-power incandescent lamp (Edison)? A SUBSCRIBER.

PHILADELPHIA, Pa.

[The simplest form of storage battery not covered by patents consists in placing lead plates in dilute sulphuric acid and passing a current so that it will go from one plate to the other through the acid. About fifty cells would be needed for your purpose.

The acid and electrodes may be held in glass, earthenware or lead vessels, and they may be of any size desirable. The larger they are, the less often will they need to be charged. Storage batteries of the best type are very expensive to manufacture singly, and may be bought at less than half the cost of making a single battery.—ED. E. W.]

Circuit Troubles—Facts and Theory.

To the Editor of The Electrical World:

SIR: In your issue of the 14th inst., your correspondent "California" asks for an explanation of a certain trouble he had with his electric light circuit. As I have had a similar experience with a telegraph circuit, and have discovered what appears to be the cause of the trouble and also of the observed phenomena, I will venture to give an explanation of the same. The facts are as follows: I am at the end of a telegraph line, and all the battery is at this end. I have often found the circuit apparently open, and on putting a galvanometer in the line would sometimes get a feeble deflection and at others none at all. But by short-circuiting the battery *through the relay* for an instant, the circuit would close and the galvanometer would indicate a current of about the usual strength. Upon thoroughly examining the whole line, I found a bad connection every time the above results were obtained.

Furthermore, as soon as the connection was properly made, the trouble at once ceased, and did not again recur until a fault had developed in some part of the circuit. At one time the ground wire had become loosened from the ground rod and was merely lying against it; at another a wire was loose in a binding post; again a splice in the office wire was untwisted, etc.

Now for the theory as to how the circuit was closed. The wires were in loose contact at a mere point, and this becoming covered by a film of non-conducting oxide, the current was broken, but by sending a powerful induced current through the line, this film was either reduced or dispersed by the spark which passed through it, and the clean metals were thus allowed to make contact. The induced current in my case was caused by strongly magnetizing the relay cores by short-circuiting my battery through the relay, and then allowing the extra current from its coils to discharge through the line when the short circuit was broken. F. M. Y.

WEST BROOKLYN, Ill.

The Gerritt Smith Duplex.

To the Editor of the Electrical World:

SIR: The definition of the Stearns duplex system, as given by "Reviewer" in your issue of the 21st ult., and which states "that it is that class of duplex telegraphy which is operated by the increase and decrease of strength of current," does not appear to us as being a sufficiently accurate interpretation of that polar duplex system known by the above title.

If by "increase and decrease of strength of current" is meant that variation of current which is produced in the line coils of the differential relay by the coincidence or opposition of the terminal batteries, and which alone appears, according to your correspondent, to constitute the principle upon which the appellation of Stearns duplex is based, then there would seem to be no reason whatever for not bestowing such title upon the apparatus known as the polar duplex, since the action of the latter in that particular respect resembles that of the Stearns.

A Stearns duplex, as distinguished from a polar duplex in the ordinary acceptation of these terms, consists in the one system being operated upon the single current principle, and the other upon the double current principle.

The Stearns duplex employs (in addition to the ordinary compensating resistances, etc.) a continuity-preserving transmitter and a non-polarized differential relay at each station; while the polar duplex system differs from this in respect of having a pole-changer and polarized relay at each terminal office in place of the single transmitter and neutral relay.

Plate XV. was described as a "polar duplex with battery at one station only," because part of the apparatus common to a Stearns duplex was therein employed for single current duplex working; while Plate XIV. was called a "polar duplex with battery at one station only," in consequence of its apparatus consisting mainly of the essential parts of a polar duplex system.

In referring to Plate XIV. your correspondent asserts that it contains (besides a pole-changer and polar relay) "one transmitter and one neutral relay, the latter two instruments being part of a Stearns duplex." We would point out that the relay in question is described in our book as a common neutral relay; that is to say, an ordinary single-line Morse relay; while the transmitter, if it can be properly so designated, consists merely of an ordinary key used for the purpose of varying the resistance of the circuit, neither relay nor key having anything in common with a Stearns duplex system.

We may add in conclusion that it would have afforded us much pleasure to have associated Mr. Gerritt Smith's name with this ingenious device had we but known at the time to whom the credit belonged. A. C. TERRY,
BUFFALO, N. Y. WM. FINN.

WESTERN NOTES.

THE ELECTRICAL WORLD BRANCH OFFICE,
CHICAGO, March 5, 1885.

The enterprise of THE ELECTRICAL WORLD, in publishing in its issue of the same week a telegraphic report covering the entire proceedings of the electric light convention, is highly appreciated out this way. Such a report, containing the pith of the whole proceedings, published immediately on the heels of the convention, and while the matter is still hot and the interest in it lively, is worth more to practical men in the business than any account brought out later, and at a time when the official verbatim report can be had in pamphlet form.

Faces which had become familiar at the convention could be seen in the city as late as Saturday. Some of the visitors were evidently prolonging their stay to become more acquainted with Chicago and its electrical interests. The Western office of THE ELECTRICAL WORLD received quite a number of visits from attendants at the convention.

I am in receipt of a circular of the Midland Electric Company of Omaha, Neb., which shows that this company is now ready to furnish any and all kinds of electrical supplies. Mr. Fleman Drake, so well known to telephone people, is general manager of the new company. Anything that Mr. Drake takes hold of is bound to "go," and it may safely be predicted that the new company will do its share of the Western supply business in the electrical line.

The Iowa Hospital for the Insane, at Mt. Pleasant, is being fitted up with an electric watch clock and fire-alarm system by the Western Electric Company. This company are also doing a large amount of contract work in the electric bell line at New Orleans just now, and are fitting up Studebaker Brothers' establishment at South Bend with a very comprehensive system.

The Cook County Hospital is being fitted up with a very novel signaling system, by which communication is established between the different wards by means of electric bells. The building is also being supplied with a fire-alarm outfit. The American Electric Manufacturing Company do the work.

C. F. Annett, general manager of the Rocky Mountain Bell Telephone Company, gave this office a call on the 28th ultimo. Mr. Annett came east by way of Omaha, and took in what there was of interest in the electrical line in that city. He returns by way of Montana, and his home trip will be a sort of inspection tour of his northeastern exchanges. Mr. Annett reports that a recent sleet storm broke down all their wires in Salt Lake City for eight blocks. They had them all in working order again in less than a week. The Rocky Mountain Telephone Company are in excellent shape, and expect to extend their lines quite considerably this season. Among the extensions will be a 40-mile line from Ketcham to Vienna, Idaho, and another from Boise City to Atlanta. A year ago the company had only four toll stations; now they have over thirty.

Mr. John Morris, formerly line repairer on the Union Pacific, and more lately with the Nebraska Telephone Company, is now in charge of the Sperry Electric Light plant at Omaha.

Some time ago an adventurous pseudo-electrician undertook the manufacture and sale of dynamos and lights of his assumed invention. With plausible arguments parties were induced to advance money, and in the meantime the inventor of what was to be the most astonishing and at the same time the largest dynamo in the world skirmished around the city and placed one or two experimental plants, which, however, did not work satisfactorily. The grand dynamo is to-day unfinished, idle and for sale for what can be realized for it, and is looked upon as a failure. The capitalists of the enterprise have ceased to come down with checks for its completion. Suit and counter-suit are the results, as I am informed, and the big machine, with all its inherent power to astonish and "frighten the world," is, like Bartholdi's statue, awaiting developments.

A system, new to us, of incandescent lighting has just opened up here, which certainly looks well, and apparently works well. The dynamo is of the Mather type, and the lamps are the Perkins form, with the waved carbon, a shape which at a short distance away confuses the incandescent outline and gives the light the appearance of a luminous disc. The lights are mostly of 12 candle-power; but observers usually consider them, without close scrutiny, full 16 candle-power. The light is peculiarly white and mellow, and the steadiness of the illumination is much in its favor. The compactness and small dimensions of the dynamo render it peculiarly applicable for positions where limited space is to be had. The company says it has come to remain, and the experimental plant is giving the best of satisfaction. The Grand Opera-House is already wired for a second plant of this system, and will be in full operation as soon as the requisite dynamo arrives from the East. A novel feature of one pattern of this lamp is the arrangement of four carbon loops, which by means of a rotating switch can be made to give the light of one or more of these at the same time. The carbons are mounted in multiple arc within the globe. This form is arranged for and used as a desk or table lamp,

and the burning out of one of the carbons does not affect the remaining three.

Mr. Weeks, of Kansas City, at the close of the convention on Friday distributed to the members of the association a blank form for conveniently and succinctly tabulating the monthly expenses of an electric light plant. The blank shows the lamps in service for each circuit up to the "all night," and a total, with a grand total of service hours. The various items which go to make up the cost of power, of dynamo attendance and performance; the attendance and other expenses of lamps; the same account of lines and poles, and, finally, the office expenses, are all given. The sheet shows at a glance the separate totals of each of the six divisions, with a grand total and all sorts of averages sufficient to satisfy the oldest statistician of any life insurance company. The blank, or something similar, will be of decided value to those who do—and all should—desire this kind of information.

Eleven towns in Kansas use the telephone for fire-alarm purposes. In such cases the local water company is provided with a gong which is rung for increased pressure by the central office. This system is equally advantageous in large cities, and in some places is said to have supplanted the usual alarm appliances.

Kansas City, Mo., wants incandescent lights.

C. D. Crandall, secretary of the Missouri & Kansas Telephone Company, is recovering from a severe attack of typhoid fever.

THE TELEGRAPH.

Brooklyn Operators.—The Brooklyn employés of the Bankers & Merchants' Telegraph Company were discharged on Saturday last, but have been all re-engaged, with the exception of Manager Rockford, by the United Telegraph Company, which has contracted to operate the lines.

Must Pay Their Taxes.—The motion of the defendants for reargument in the suits of the People against the Gold & Stock Telegraph Company and the Western Union Telegraph Company has been denied, with costs, by the Court of Appeals of this State. The decision, reported recently in these columns, is to the effect that the tax on the franchise of the companies applies to the total amount of their capital stock, and not alone to that portion representing their property in this State. It is said that nearly a million dollars becomes due under this ruling.

Telegraphers to the Front.—Instructions were received at Aldershot lately from the English War Office to prepare another detachment of the Telegraph Battalion, Royal Engineers, for immediate embarkation for South Africa. This detachment will consist of telegraph clerks and linemen. With the departure of this draft nearly the whole of the effective strength of the Telegraph Battalion will have proceeded on active service, three strong drafts having already proceeded to the Cape, in addition to the large staff now engaged in Upper Egypt.

Cable Repairs.—A dispatch from the cable station at Rye Beach, N. H., dated Feb. 28, says: The Brest (France) and St. Pierre Miquelon section of the French cable, which was broken on Jan. 19, was repaired to-day, thus restoring a continuous communication by this route between this country and France. The repair, which was made by the cable steamer "Minia," has been a very quick one, as, apart from the bad weather and the ice floes encountered, there are no less than half a dozen other cables running through Ravenal Bay, where the break occurred.

Electricians Enrolling.—The Electric Council of the National Union was formed on Tuesday, 24th ult., at Pittsburgh, Pa., with a large number of charter members from the telegraph, telephone and electric light companies of the city. The following officers were elected: President, W. M. Munson; Vice-President, M. H. Markle; ex-President, W. C. George; Secretary, J. F. Hunt; Financial Secretary, J. D. Rhiver; Treasurer, A. C. Gray; Speaker, J. R. Bingler, Jr.; Chaplain, J. C. Stewart; Usher, J. M. Edwards; Sergeant-at-Arms, F. B. Williams; Doorkeeper, F. E. Reed; Medical Examiner, J. F. Watson.

Suits against the Western Union.—Suit has been brought, at Philadelphia, against the Western Union Telegraph Company by Morris Stern, to recover damages for failure to deliver a telegram which he sent from Cumberland County to a dealer in that city, ordering a supply of goods to be sold at a county fair. Wilburt Richman brought suit against the same company, to recover for the alleged erroneous transmission of a message. He inquired of a New York dealer how much he would pay for turkeys, and received in reply a telegram stating "33 cents." Mr. Richman acted on this information, and purchased a large quantity of turkeys at 25 cents, but afterward found that the New Yorker wrote the telegram 22 cents.

The "Mackay-Bennett" Steamer.—A dispatch from Halifax, N. S., reports: The Commercial Cable steamer "Mackay-Bennett" arrived in port yesterday, having left London Feb. 17. She reports having experienced a series of gales and hurricanes during the entire voyage. All the officers agree that they never before experienced such weather at sea. Feb. 23 the ship encountered a hurricane from the north-northwest. On Friday last she passed through the centre of a terrible hurricane which came from the southward and lasted six hours, but the ship weathered the gales in a splendid manner and did not suffer the least damage. The officers unite in declaring that the "Mackay-Bennett" is a handsome craft and a magnificent sea boat, and one of the finest specimens of modern marine architecture. She steams 11 to 12 knots an hour. She will make Halifax her headquarters.

THE TELEPHONE.

New England Subscribers.—The number of telephone exchange subscribers in the New England Company was 15,549 Feb. 1. The instruments in use Feb. 1, 1884, were 17,459. The number Dec. 1, 1884, when the last report was made, was 17,715.

Intercontinental.—The Intercontinental Telephone Company has re-elected its board of directors, and re-elected the officers. The statement of the general manager shows, that the company gained 325 subscribers last year, and had 600 sets of instruments in use Dec. 31. The gain on receipts over the previous year was $22,477, of which amount $18,221 was put into the plant in Venezuela. The increase in the plant during the year was $32,260. Other statistics have been published heretofore.

Marriage Bells.—Mr. H. Fred Stevens, ex-cashier of the Lowell division of the New England Company, was married at South Framingham, Mass., on Feb. 25, to Miss Ida Howard. The event created a good deal of interest in telephone circles at Lowell, and costly gifts were presented by Messrs. C. J. Glidden, W. A. Ingham, F. J. Boynton and others. Mr. Stevens has proceeded with his bride to Minneapolis, Minn., where he will fill the position of cashier of the Northwestern division of the Erie Company.

Bell Telephone Patents in Canada.—A writ of certiorari was applied for at Toronto, on Feb. 25, before Judge Galt, to bring up all proceedings taken before the Minister of Agriculture, at Ottawa, in the Bell Telephone Company's patent case, with the object of moving there to review the minister's decision. Judge Galt thought the questions raised of sufficient importance to warrant him in sending the motion for argument before the common pleas divisional court in May next, and granted an order accordingly.

The New President of the Erie.—A Lowell correspondent says of James W. Bennett, the new president of the Erie Company, that he was elected a director at the late organization, and has been considered the leading spirit of the new management. He is one of Lowell's self-made men, who, by indomitable energy and shrewd business sagacity, has become one of that city's foremost men and property holders. He is reported to have large interests in the Erie Company. Of the original Erie management, or "Lowell syndicate," so called, but one now remains incumbered, by responsibilities of management, and that is the company's treasurer, Charles J. Glidden. Mr. Bennett's election gives good satisfaction in Lowell.

The Pan Electric.—Capt. J. D. Randall, secretary of the Memphis Pan Electric Telephone Company, Memphis, Tenn., having expressed to Mr. J. E. Johnston, president of the Pan Electric Telephone Company, his apprehension that suit might be brought against him by Memphis licensees of the American Bell Company, the latter gentleman has replied in a consolatory and cheering way from Washington, and advises his timid correspondent as follows: "We are prepared to assume the cost and defense of whatever litigation may be brought against any person or corporation for using the Pan Electric Telephone under authority given by this company, or any of its licensees, and we therefore desire that you pay no attention whatever to mere idle threats of instituting suit against you, but continue your operations as rapidly as possible, applying to us for telephones as fast as needed, and they will be promptly forwarded to you. We hardly think the Bell Company or any one operating under its franchises will undertake to interfere by any legal proceedings with the prosecution of your work, but should suit actually be brought against you, please advise our Memphis attorneys, Messrs. Morgan & McFarland, Gantt & Patterson, Wright & Fowlkes, of the fact, and they will at once assume direction of the matter and give it such attention as may be required."

San Domingo.—The Puerto Plata *La Libertad* says: "Mr. Preston C. Nason, general superintendent of the "Domingo Electric Company" called to pay his respects to us during the stay of the steamship "Santo Domingo" in port. Mr. Nason is *en route* to the capital with six assistant engineers and electricians, and four hundred tons of cargo, by a chartered vessel, consisting of electrical apparatus, copper wire, poles and cross arms, horses, mules, wagons and general supplies for his company, and will commence at once the building up and establishing of the first telephone central at the capital. We are much pleased in seeing this enterprise put into operation so promptly, in true American style, and Mr. Nason assures us that within a few months he will commence the building up of a first-class telephone central in Puerto Plata. A notable feature of this enterprise is the fact that only copper wire will be used in the establishment of this telephone plant, for after several scientific tests Mr. Nason considers that iron or steel wire is unsuitable for this climate. The copper wire is not only indestructible by climatic changes, but is also far superior as a conductor of electrical currents, and gives more distinct articulation in the telephone apparatus. This company is also putting in the latest improvements in wood and iron working machinery, and will make and furnish everything in the electrical line at their manufactory in Santo Domingo City. We give hearty welcome to this grand enterprise.

THE ELECTRIC LIGHT.

Cincinnati, O.—Heuck's Opera-House will shortly be lit by electricity.

Hamlet Left Out of the Play.—According to a paragraph now tramping the country, the English, Scotch and Irish newspapers are publishing a "History of the Electric Light," in which no reference is made to America or American inventors.

St. Louis, Mo.—The plant of the Edison incandescent system in the J. Kennard & Sons Carpet Company's establishment has been put in operation. A new and large rink now being erected in the western part of the city will be lighted by arc and incandescent lamps.

Electric Lights for Newport, R. I.—A dispatch of Feb. 27 says: The Newport City Council to-night voted down the three years' contract for electric lighting at reduced rates, and passed a resolution to contract with the Thomson-Houston company for 58 lights for one year at 63 cents per night.

The Electric Headlight.—Engine No. 45, on the Vandalia line, says the Pittsburgh *Dispatch*, is the only one having an electric headlight. In a recent talk with some acquaintances Mr. H. Ostermiller, the engineer, said that the American Locomotive Headlight, with which his engine was equipped, performs admirably, and it is as safe to run by as daylight. It is less troublesome to keep in order than the coal-oil headlight.

The Electric Light in the Service of the Thames Police.—We learn from *Engineering* that in view of the recent dynamite outrages, the London Commissioners of Police appear to be at last awakening to the desirability of affording a little more protection to the highway which carries over it a greater amount of wealth than any other in the world. Recently, an electrical search light was tried in front of the Houses of Parliament with considerable success. The current was generated by a chloride of silver battery, and was used in a small arc lamp. The cells were very small, and were contained in two boxes, each mensuring 10 in. by 8 in. by 6 in.

In a Large Dry Goods Store.—The new building occupied by Wechsler & Abraham, on Fulton street, Brooklyn, is one of the very finest dry goods palaces in the country. The decorations are sumptuous throughout, and in order to enhance the effect, as well as to add to the comfort of their patrons, the proprietors have made a large installation for electric lighting. The system used is the Excelsior, or Hochhausen. In the sub-cellar of the building are four 15-light dynamos, to run arc lights of 2,000 candle-power each, and one incandescent dynamo to run 40 lights of 20 candle-power. The dynamos are driven by a 120 horse-power Twiss engine. Seven of the arc lamps are hung outside the building; twenty-two on the main floor; twenty-one on the second floor and ten in the basement. In the ladies' parlor there are twelve incandescent lamps of 20 candle-power. The chandelier is very rich and beautiful, the work of the Vosberg Manufacturing Company, of Brooklyn. A noticeable feature in it is the combination with the electric lights of twenty-four gas jets of about 1 candle-power. The effect is remarkably pretty. Twenty more incandescents will be distributed in the sub-basement, and sixty more arc lights are to be put in. Each machine has a friction clutch-pulley from A. & F. Brown, Park place, New York. The whole plant is a specimen of thoroughly good and creditable work, reflecting great credit on the Excelsior Company.

APPLICATIONS OF POWER.

New York Elevated Roads.—It is understood that electric motors of a well-known system will soon be operating on a large section of the Ninth Avenue road.

Dundee, Scotland.—It is understood that the Dundee and District Tramway Company are making arrangements for testing a car worked by electricity on their lines. It is stated that the car, which is capable of carrying forty-six passengers, can be worked on almost any gradient, and that the power motor is equal to eight or ten horses. The makers are so confident of the suitability of the car that they have offered the company the option of purchase at the end of the month.

MISCELLANEOUS NOTES.

Congratulations.—We are glad to receive from Mr. Wilhelm Siemens, Berlin, an announcement dated Feb. 7, of the birth to him of a fine boy. There cannot be too many Siemenses in the world.

Kind Words.—A Western correspondent writes us under date of Feb. 23: "I consider THE ELECTRICAL WORLD the best paper it has been my fortune to obtain. It treats of the very subjects I wish to know more about."

New York Electrical Society.—At the meeting of the New York Electrical Society on Feb. 25, Mr. Henry A. Sinclair, electrician at the United States Ordnance Proving Ground at Sandy Hook, illustrated and described the means adopted for ascertaining, with the aid of electricity, the velocity of a projectile.

Influence of Petroleum Cans on the Compass.—It is asserted that refined petroleum in tin cases exerts an influence on the compasses of a vessel equal to the same quantity of iron or steel. The masters of the German ship "J. Weisselholm" and the schooner "Maggie Dalling" have sent in reports confirming the above statement; and in the latter case the captain asserts that his vessel went ashore through an error caused by cased petroleum.

New York Electrical Society.—The annual meeting of this society will be held on the 11th inst. at Room 25, Cooper Union, when the officers for the ensuing year will be elected. The subject for discussion is "Railroad Telegraphy." Mr. Henry D. Hall will describe the Phelps system of inductive communication with moving trains. The meetings of the society are held every second and fourth Wednesday in the month. The dues are only $3 per year. A library of scientific works and the Patent Office reports are available. Prof. P. H. Vander Weyde has been President during the past year.

The Earth a Magnet.—Everything on the earth and in the air above is permeated with the earth's magnetic force—it goes through your clothes, it penetrates your bodies, it saturates your brains—it is a part of life itself. Gaus, the illustrious German astronomer, has computed (taking as a unit of his measure a magnet fourteen inches long, one inch wide, one-fourth inch thick, weighing one pound, made of the hardest steel and of the strongest magnetic force possible) the earth's magnetic force as equal to 8,464,000,000,000,000,000,000 such magnets. The attracting or lifting power of such a magnet is about ten pounds, which would make the attractive power of the earth 42,310,000,000,000,000,000 tons. If this magnetism were equally distributed throughout the mass of the earth, the magnetic intensity of each cubic yard would be equal to six of these magnets, or about sixty pounds attractive force. Professor Mayer has shown that this magnetic influence, this invisible force, is a power filling space to an unknown distance and radiating in the lines of magnetic force very much as the rays of the sunlight, the lines of the earth's magnetic force being from south to north, as indicated by the compass needle.—*Horological News.*

Electric Gas Lighters.—Before the International Society of Electricians, Paris, M. Napoli submitted lately, on behalf of M. Arnaux, a number of electric lighters, all based on the same principle. The principal organ is a tube, about the size of an ordinary lamp chimney, in which is placed a stick of carbon of the same length as the tube, a bar of zinc, one-third the length, and an exciting liquid which when the instrument is vertical does not touch the zinc. By reversing the apparatus, a current is generated which is used either to redden a thin platinum wire, or produce a succession of sparks between two terminals. Another instrument by the same maker is employed to detect gas escapes. It consists of a similar reversing battery, and a supplementary part in which is a platinum wire inclosed within a fine wire gauze envelope, the line being brought to red heat by the current. In the event of a gas escape, the temperature of the wire is

increased, and by a somewhat complicated system a signal bell is set ringing.

The Waldumer Electric Brake.—Successful experiments have been recently made at Cincinnati with this brake. The tests were made on the Cincinnati, Washington & Baltimore division of the Baltimore & Ohio Railroad, and were under the immediate supervision of General Manager I. H. Stewart, and Master of Transportation I. E. Rose. The brake has been in use for several months. The special trial referred to was made with a heavy coal train of ten cars, each car weighing, empty, about eleven tons, and having a tonnage capacity of 40,000 pounds. The brakes were applied only to the freight cars and caboose, there being none on the locomotive or superintendent's car, and no hand brakes were used. The loaded train, with full steam on, was put to a speed of 48 miles per hour on a down grade of 68 feet to the mile, and brought to a dead stop in 37½ seconds after putting on the brake, the distance run in that time being 445 yards, exact measurement. The brake acts automatically in case the train should part, and signals both cab and caboose, and applies the brake to the rear portion, still leaving the engineer with complete control of the forward portion.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—Am. Cable, b 54½, a 56; B. & M., b 1, a 2; Mutual Union, b 14, a 16; Western Union, b 59¼, a 59⅝.

The New York *Times* of March 5 says: Young Mr. Gould made a few trades in Western Union yesterday. He sold 1,000 shares of Western Union at 59, and subsequently bought a quantity of the same stock at 58¾. The idea that Jay Gould's son should be found scalping his father's favorite stock caused a good deal of amusement in the board room.

Telephone.—Am. Bell, b 219, a 220; Erie, b 23, a 23½; New England, b 28⅝.

Electric Light.—No new quotations.

BUSINESS NOTICE.

The preferred stock of the Telemeter Company is an investment which is well worth the investigation of parties desiring to buy electrical securities. The company have, after two years' exploiting, perfected their system of Telemetry, and are now prepared to install, commercially, instruments on the rental system. Like the telephone, it has the advantage of an extended field of application.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED FEB. 17, 1885.

System of Firing Battery Guns in Turrets by Electricity; Theodore R. Trinby, Nyack, N. Y..... 312,231

This invention relates to a system of discharging guns in revolving battery towers, by means of which each gun or vertical file of guns is discharged automatically and with precision as it reaches the line of fire determined by the officer in charge, who is enabled to control and direct such line of fire with facility and accuracy.

Galvanic Element; Alfred Dun, Frankfort-on-the-Main, Germany..... 312,339

This galvanic element is principally intended for electric-lighting purposes. The element consists of two cells, and differs, essentially, from those now used in this respect, viz., that both the outer and inner cells contain the same solution as exciting-fluid, but in different degrees of strength. That in the cell for the carbon electrode is made very strong, while that in the cell for the positive electrode is weak. The weak solution serves as a dissolving agent for the positive electrode, while the strong solution, in combination with the carbon, acts as a depolarizer. The invention is illustrated in the accompanying drawing, which represents a perspective view of a bicellular battery, and in which *A* indicates the outer cell containing the positive electrode *B* and the weak solution, and *C* represents the inner cell containing the carbon or negative electrode *D* and the strong solution. The patentee prefers to use nitro-muriatic acid (aqua regis) as the exciting liquid, and claims that the cell will remain constant for at least twenty hours, when employed for incandescent lighting.

Apparatus for Emptying and Charging Galvanic Batteries; Alfred Dun, Frankfort-on-the-Main, Germany..... 312,340

The invention consists of a series of supply-troughs and dipping-vessels suspended in the former and connected with the battery cells. There are also means for raising and lowering the vessels in order to empty or fill the cells as required.

Telephone; James Lowth, Chicago, Ill..... 312,365

This invention relates to the art of telephoning by utilizing the vibrations of the vocal organs to affect the transmitting apparatus. (See following patent.)

Telephone; James Lowth, Chicago, Ill..... 312,366

The invention is based upon the fact that those exterior parts of the human body which are located in the vicinity of the vocal organs (such, for instance, as the exterior surfaces of the throat, and especially those parts near the larynx) are subject to certain disturbances or vibrations accompanying the exercise of the vocal organs, and that those disturbances or vibrations are such that they may be communicated to a telephone so as to cause the transmission or reproduction of words or other sounds uttered by

PATENT NO. 312,599.

the organs of speech. The illustration shows the apparatus used, which serves as a transmitter. *D* is a coil surrounding the magnet *C*. In front of this is the diaphragm *D'*. *F* is a rod which extends through the tube *E*, and touches the diaphragm. *H* is a head attached to the end of the rod; the latter is pressed against the throat, and, when speaking, the vibrations are transmitted to the diaphragm, and similar impulses are sent over the line.

Hanging Balanced Electric Lamp; Thomas T. Smith, London, Eng..... 312,394

The object of the present invention is to provide inexpensive and efficient means for suspending incandescent and other electric lamps from ceilings and other points of attachment, which will permit of the position of the lamps being adjusted vertically within a considerable range without interrupting the continuity of the electrical circuit, and also enable the lamps and their fittings and supports to be readily detached from the ceiling or equivalent surface and removed when required.

Insulated Electrical Conductor; Wm. P. Thomas and Ed. J. Frost, of Philadelphia, Pa..... 312,405

In this invention the conducting wire is first prepared with a layer of japan baked on it, then covered with rubber, and around this a wrapping of asbestos, the whole being inclosed in a metallic pipe.

Telephone Transmitter; Henry E. Waite, New York, N. Y..... 312,409

This is an improvement on what is known as a "box-transmitter," in which one side of the box has an opening forming the usual mouth-piece, and behind which opening the diaphragm is supported. The device consists of a case having a front perforated plate provided with a recess or ledge, which supports a diaphragm. A spring finger is secured to the plate, holds the diaphragm in position and bears upon its free ends one of the electrodes. The other electrode is held in contact with the former by a second spring attached to the plate.

Switch-Board; Henry E. Waite, New York, N. Y.... 312,410

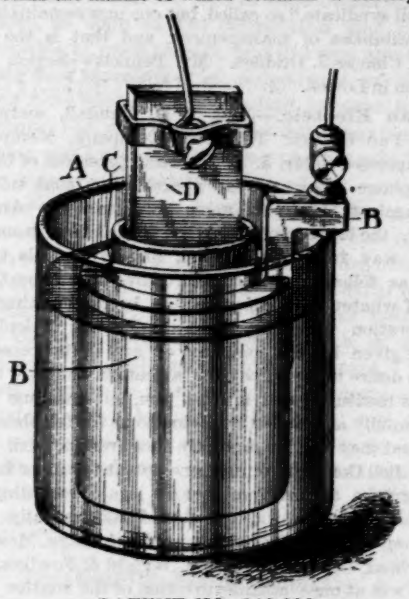
This telephone switch-board consists of a board having a number of recesses in which are the annunciators connected to the several lines. A series of spring-supported pins pass through the board, and in front of them are a series of horizontal bars. These bars carry a number of spring-jacks or levers which are adapted to make contact with the pins and break the ground connection of the subscribers' lines and to place two subscribers in electrical connection through the bars.

Apparatus for Synchronizing Clocks; John A. Lund, London, England, Assignor to the Standard Time Company, New Haven, Conn..... 312,482

This mechanism for synchronizing clocks consists of a pair of fingers arranged to approach each other to turn the pointer at a predetermined time, one of the said fingers projecting from an arm hung upon a pivot to swing in a plane substantially parallel with the plane of the dial, and provided with a counterbalance arranged to permit the finger to be turned toward the opposite extreme under the action of the pointer, so that as it approaches the opposite extreme the pointer will escape therefrom. The counterbalance serves to return the finger, and mechanism is provided for turning the fingers at a predetermined time.

Electro-Magnetic Comb; Wm. T. Maginnis, New York, N. Y..... 312,487

This is a comb the handle of which contains a battery and in-



PATENT NO. 312,339.

duction coils. The teeth of the comb are hollow and have small metal conductors passing through them connected with one of the terminals of the induction coil. The handle of the comb is connected with the other terminal. The object of the invention is to supply electricity to the scalp and roots of the hair.

Telephone; Wm. R. Miller, Baltimore, Md..... 312,492

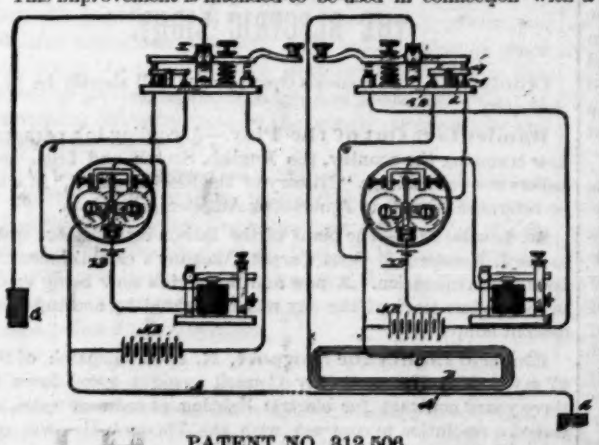
In this telephone receiver the usual diaphragm cover or plate which is applied to the ear is inclosed in a flexible sound-insulating cup, which surrounds the cap but is independent of it. The cup fits over the entire ear, and thus prevents the escape of sound from the telephone.

Receiving Instrument for Electrical Reporting; Wm. M. Pease, Pittsburgh, Pa..... 312,503

In this system a positive and a negative circuit are employed. One of the circuits is normally closed, and so remains until the mechanism connected therewith makes the first break in the circuit. Immediately thereupon the first circuit is permanently opened and the second circuit completed. The report is then made through the medium of the second circuit, and when the report is finished the second circuit is broken and the first circuit reinstated in its place. In this system it is possible that two or more reports may be sent over the line in quick succession, and unless adequate means for distinguishing these reports are supplied they may become confused. It is the object of this invention to aid in the changing of the circuits, to prevent confusion of reports, and to maintain a permanent time record of all reports received.

Alarm Mechanism and Apparatus for Operating the Same; William M. Pease, Pittsburgh, Pa..... 312,504

This improvement is intended to be used in connection with a



PATENT NO. 312,506.

system of automatic electric railroad-train reporting. The object of the invention is to provide a single alarm mechanism capable of reporting the passage of trains moving upon the track in opposite directions.

Railway Telegraph; Lucius J. Phelps, Assignor to the Railway Telegraph Company, New York, N. Y... 312,506

For a full description of this invention see THE ELECTRICAL WORLD, Feb. 21, 1885.

Electro-Magnet; Ernest T. Recordon, Paris, France. 312,511

This invention relates to that class of electro-magnets in which the end pieces or cheeks of the bobbin are of iron and in magnetic contact with the core, which is preferably hollow, the object of the invention being to construct a powerful electro-magnet. The electro-magnet is provided with a tubular core, and at opposite ends with iron cheek pieces, composed of thin superposed plates, which are flattened at the side to form the acting polar faces. The armature is adapted to lie parallel, or nearly so, with the core of the electro-magnet.

Cut-Out for Electric Lamps; Wm. M. Thomas, Grand Rapids, Mich..... 312,529

The carbons of an electric lamp are placed in a loop of the main line and have an electro-magnet or coil which is wound with both legs or branches of the loop in which the lamp is placed. The armature of this magnet forms one terminal of a shunt circuit, which is automatically completed by the attraction of the armature, when the arc length or resistance in the lamp exceeds a certain limit.

Telephone; Thomas Wallace, New York, N. Y..... 312,533

The object of this invention is to produce an electric telephonic system embracing neither magnet cores nor helices, local circuits, nor induction coils, and to use the same form of battery telephone both as a transmitter and a receiver. The system includes a transmitter consisting, essentially, of a carbon rod supported in carbon bearings upon a resonant body arranged in the main galvanic circuit, and a receiver consisting of a similar carbon rod supported in carbon bearings, and connected to a resonant body in a branch circuit around the transmitter.

Apparatus for Treating Carbons for Incandescent Electric Lights; Ed. A. Colby, Newark, N. J., Assignor to United States Electric Lighting Company, New York..... 312,552

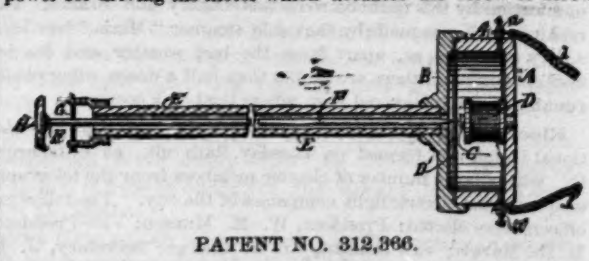
In the manufacture of certain kinds of electric incandescent lamps, the carbon filament has a deposit of carbon formed on it by heating it to incandescence in a hydrocarbon gas or vapor. When this is done too rapidly, however, the deposit is granular and not so effective. The main object of the present invention is to prevent the too rapid dissociation and deposition of carbon, and this is effected by lowering the electromotive force in the treating circuit in proportion to the reduction of the resistance of the carbons under treatment, so that the carbons may not be brought to too high a degree of incandescence.

Electric Railway; Leo Daft, Greenville, N. J..... 312,557

The invention consists in the combination, in an electric-railway system, of a stationary dynamo adapted to generate currents of low tension, conducting rails for such currents practically non-insulated, and cars provided with electric motors constructed to make electrical contact with the conductors and to be operated under currents of low tension.

Torpedo; Thorsten Nordenfelt, Westminster, Eng..... 312,579

The electrical arrangements of the torpedo are as follows: The power for driving the motor which actuates the screw or screws



PATENT NO. 312,366.

and for operating the guide-rods—that is, raising and lowering them—and for operating the rudder, is an electric current derived from a storage or other battery carried in the torpedo itself. The whole of the electric current from the battery contained in the torpedo is utilized to drive the motor, except when a small portion is diverted for the performance of either of the other functions, such as lighting the electric lamps, or operating the guide-rods or the rudder. Guide-lights are provided for night runs. They are incandescent electric lights, the electric current for which is derived from the battery contained in the torpedo. The incandescent lamps will only be lighted when the guide-rods are raised, as the lamps are put in and out of circuit by the movement of the guide-rods. The controlling arrangements of the torpedo consist of one or more electric cables and a small battery at the directing-point. The electric current from the battery at the directing-point controls circuit-closers in the torpedo and brings the electric power contained in the torpedo into play.

Wire Splicer; Patrick A. O'Malley, Brooklyn, Assignor to Henry L. Bailey, same place..... 312,580

The object of this invention is to facilitate the temporary connection of wires in fences and other places. The invention consists of a collar which fits over the two ends of the wires; a conical pointed screw fitting into a screw hole of the collar is forced between the two wires and presses them firmly against the sides of the collar.

Circuit for Systems of Electric Lighting; Wm. M. Thomas, Grand Rapids, Mich..... 312,589

The object of the invention is to provide an improved organization, so that at remote parts in the circuit, where it may be desired, a few lamps of increased candle-power can be burned in preference to a greater number of smaller lamps. The invention consists in the combination of two generators and their independent circuits, so arranged that the circuit of one generator nominally traverses the field-magnet coils of the other. At the required point there is a conductor common to both circuits, and a local branch circuit and switch to each machine, by which it may be connected for self-excitation should the other fail to act.

Secondary Battery; Jos. W. Swan, Newcastle-upon-Tyne, Assignor to the Electrical Power Storage Company, Limited, of London, England..... 312,599

The object of this invention is to facilitate the construction of secondary batteries, and the production of plates having surfaces more suitable for holding the active material, such as spongy lead. The accompanying illustrations show respectively a front elevation and transverse vertical section of the plate. The plate is constructed with cells or cavities *a*, which extend through the plate and in which the active material, such as spongy or finely-divided lead or the material to become active, is packed. The outer surface of the walls *b* of the cells may be covered or coated with the spongy or finely-divided lead.